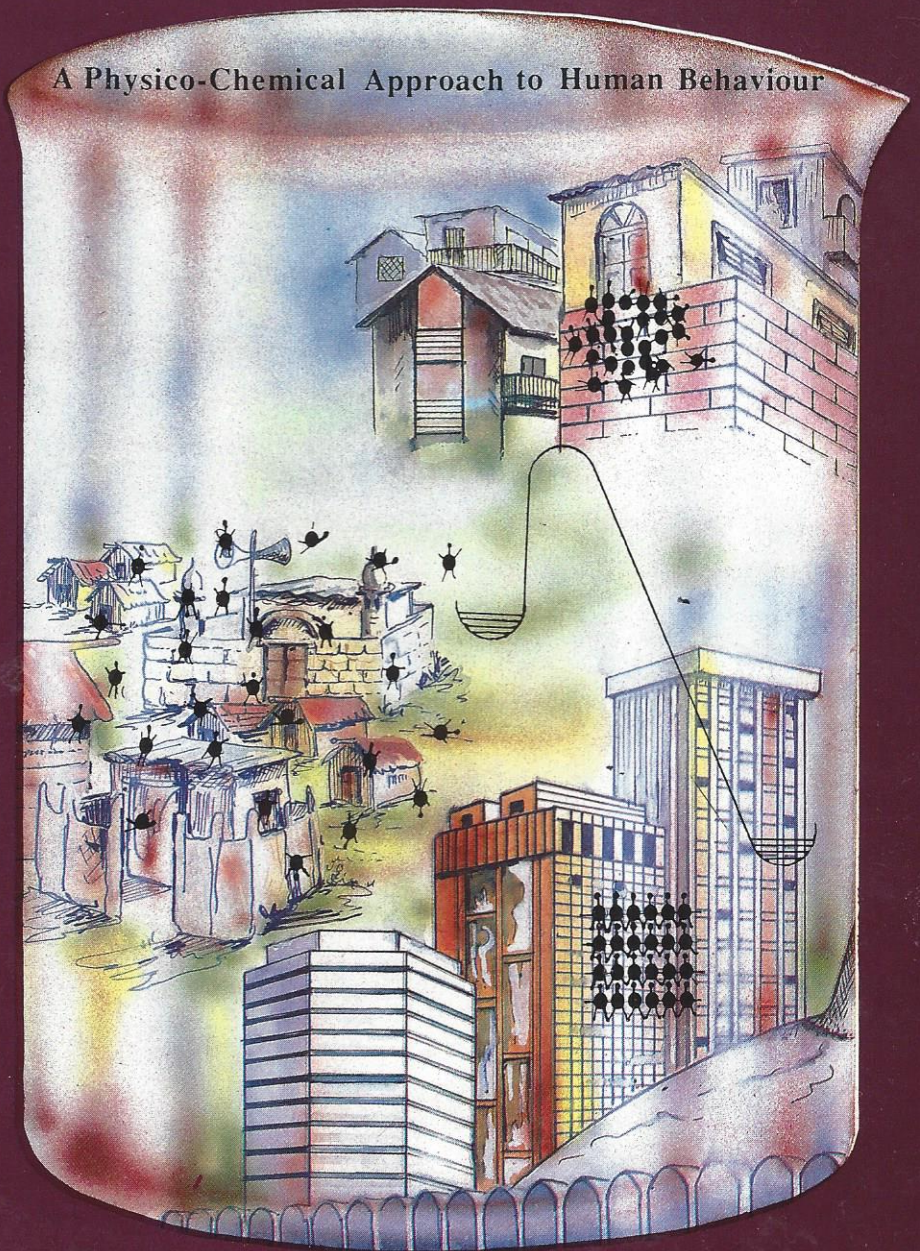
NEW DIMENSIONS IN SOCIOLOGY

A Physico-Chemical Approach to Human Behaviour



MIRZA ARSHAD ALI BEG

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Dedicated to
Ishrat Jabeen, my wife,
Huma Tazeen, daughter and
Farrukh Amir, son

FOREWORD BY A SCIENTIST

Man's observations of natural phenomena have fascinated him throughout the recorded history and have provided him a base for development of theoretical ideas. He has sought similarities occurring in two different systems, the social and the natural, and has attemped to derive corollaries in support of his theories. The interpretation of the atomic structure in terms of the solar system by Bohr, the structure of benzene as a ring on the basis of a model of a snake with its tail in the mouth postulated by Kekule and the determination of density by the loss of weight of a body on its immersion in water, attempted by Archimedes are some such examples where the latter set of observations were superimposed on the former system to arrive at an acceptable soution of complex phenomena.

The book, 'New Dimensions in Sociology, A Physico-Chemical Approach to Human Behaviour' by Dr. Mirza Arshad Ali Beg is a new approach in which he has tried to establish an interface between physico-chemical and social sciences. It makes an interesting reading and provides a basis to quite a few socialization processes like assimilation, migration, mind-body split, etc.

Human behaviour comprises a series of reversible and irreversible processes involving interactions of fellow humans under the constraints of the environment. Man has of necessity to adjust to satisfy his needs within his locality and in his country. In fact, the geographical, economic, social and political conditions determine the course of many of the interactive processes he witnesses and this has profound influence on his behaviour. He has to withstand, for example, the extremes of climatic conditions, the authoritarian attitude of the elders of the family, follow the norms of the society and abide by the rules and regula-

tions of the country. This indicates the validity of the logic that there are certain forces acting on an individual in a society similar to those on particles. This could be understood by devising a series of equilibrium processes which may occur as a result of the interaction of one with the other individuals of the society and his surroundings and this is the theme of the book written by Dr. Beg, an eminent scientist and at one time my student. One may agree with him that such attempts can at least reduce the degree of empiricism through limited predictibility attained by such an approach in social science, if they cannot arrive at a formula for predictible behaviour.

The author has suggested a universality of phenomena, the attraction and repulsive forces at atomic and molecular level, micro- and macro-cosmic level and among celestial bodies to be operative also among human beings which are an integral part of the universe and that similar forces should govern their interaction or behaviour. For this purpose he has used several analogies between material and human systems from historical events and chemical interactions to explain human behaviour aspects of an ideal society, fugacity, migration, proportionate representation, assimilation of races, human interaction and socialization, affinity, hypocrisy, loss of degrees of freedom and listening, leadership, environmental adjustment, etc. The author believes, for example, that a society is comparable to a physical soultion which would be ideal if the interaction among the components of these two systems is uniform. Such a society was present at the time of the Prophet Muhammad (be peace upon him) when interaction among Sahaba and Muhajireen was so congenial as to compare with the physico-chemical laws for ideal solutions.

One may appreciate the author's analogy and his hypothesis on the driving force and free energy being responsible for the sudden burst of energy among the

FOREWORD BY A SCIENTIST

Arabs after the appearance of the Apostle of God (be peace upon him). The explanation for the loss of driving force of the Muslim society to the increase in entropy or randomness by the author also appears to be interesting. The strength of a society is explained in terms of molecular association and dissociation for life seems to be ultimately molecular. These and several other aspects of human behaviour have been given a physico-chemical interpretation which make the book worthy of serious reading. If the hypothesis proposed by the author is established in the course of time it is likely to make a breakthrough in our understanding of sociology. I am sure this presentation will invoke considerable interest amongst social scientists.

M.A. Kazi

Dr. M.A. Kazi

FOREWORD BY A SOCIOLOGIST

Since the time of Aristotle, man's social being and his behaviour have received constant attention and definition at the hands of philosophers and thinkers who have undertaken the study of man as a social animal. A number of theories and views have been expressed by Greek and Muslim thinkers who have explained the phenomena or factors which governed the behaviour and ideas of man. Towards the end of last century, the discipline acquired new dimensions and directions at the hands of different philosophers who endeavoured to define it as a science worthy of explanation through application of scientific methods, experimentation and observation etc. These were designed to draw inferences after scientific investigation, for the society. The process of study in interaction has also come into eminence with emphasis on micro level studies. Here is now an attempt to develop new dimensions of the scientific growth of sociology by applying physico-chemical approach to explain social relationship in society.

The New Dimensions in Sociology by Dr. Arshad Ali Beg, is a laudable and bold step to interpret and identify several concepts in terms of physico-chemical analysis. He has painstakingly dealt with concepts like migration, affinity etc. in this context. The scientific study of society and its concepts, with such approaches, will enhance and acquire more authenticity and reliability in the data and study of Sociology.

The author has picked up similarities in the behaviour of particles and of human beings. He has explained certain events while discussing the similarity as a natural outcome of the physical process. He believes that a society is like a solution which is ideal without impurities but gradually deteriorates with their input. The society will also be ideal

if the members of it share similar values, culture and ideas; urbanization is like distillation process in which particles move out because of disturbing factors in their environment. However, we must bear in mind that the behaviour of particles is being governed by physical properties, while human behaviour is governed by factors originating from the mind. If similarities, as presented by Dr. Arshad Ali Beg, could be observed, could we frame a set of laws from the physical properties of particles as applied to human behaviour as an individual or a group etc? For such purposes the suggestions will have to be put to test according to the events of history, and observe whether the pattern corresponds to the natural cycle as observed on the planet. If it could stand the test, his ideas, presented in the book will rediscover new frontiers in sociology and will revolutionalise the existing theories of human behaviour as it has so far been propounded by philosophers.

Dr. Beg's approach is almost a pioneering effort and his style of writing is matter of fact and demands adequate knowledge of physical chemistry. It nevertheless remains solid and original work and I can say that it is a very creditable attempt. Dr. Arshad Ali Beg has utilised his scientific knowledge in an adept manner to explain and propound his theories and suggestions.

I am sure that the book will provide good material to researchers and scholars of not only Sociology but of other Social Sciences as well.

Jameel Jalibi

Dr. Jameel Jalibi

AUTHOR'S PREFACE

In 1974, I was nominated to attend an advanced training course at the National Institute of Public Administration, Karachi. As a chemist working on fundamental aspects of coordination and organometallic chemistry, it seemed odd and totally unrelated to me. However, the first lecture by Mr. Mumtaz was quite polarizing when he said that if the lectures during the following weeks could create a disturbance, even though slight, in the thinking of the participants, the objectives of the course would be attained and this led me to take the course with an open mind. I devoted quite a bit of my time to course material, picking up points related to Chemistry and interpreting them in physico-chemical terms, wherever possible. A peculiar feature of the course was that the lecturers were using terms, like polarization, activation, potential energy, complexes, compounds, perhaps metaphorically and in an unrelated context. This compelled me to ask some of them if they were aware of the real sense of the terminologies which have actually been borrowed from Chemistry or Material Sciences. As expected, they had no clue to them and this prompted me to write a few notes, relating physico-chemical terminologies to those of human behaviour. I was encouraged in doing so by Dr. A.H. Siddiqi, the then Deputy Director of the Institute, who thought it would be a valuable contribution to the field of sociology.

The above notes were mimeographed and they appeared as a booklet 'Human Behaviour in Scientific Terminology' in 1976. Four papers were published out of this booklet in the local journals. The response from the readers was very encouraging and in the light of the comments received it transpired that the pertinent data had to be put in urgently to provide a quantitative basis to the hypothesis.

However, time had become scarce for me since my responsibilities had in the meantime increased. My present assignment is scientifically less demanding but I had to sacrifice my leisure hours when only it became possible to update the booklet. I finally managed to give it the present shape whereafter I requested a reading from Hakim Mohammad Said who besides reading the manuscript himself very kindly passed it on to Dr. Mahdihassan and Mr. Khalid Ishaque for their comments. It was, indeed, very heartening to receive a letter from Dr. Mahdihassan within fifteen days suggesting that this is a novel contribution and should be published by Hamdard. Hakim Saheb agreed and suggested submission of the manuscript in the final form.

This was an uphill task but it became possible through a blessing in disguise. A check up at the hospital revealed that I had developed a heart disease which necessitated long leave to have complete rest. This provided me time to finalise the manuscript in spite of severe resistance from my wife and children, and whatever appears in the following pages is a result of exclusive attention made possible by them during this period and hence the book is dedicated to them.

Human behaviour and physico-chemical laws seem to be inter-related, but time and again it has been questioned whether the enormously complex processes of human behaviour could have a scientific basis at all. The human organism has a limited dimension and there are a number of actions and reactions taking place within as well as on it and to all of these the Heisenberg's uncertainty principle applies. Thus it is apparently beyond the range of predictive or reproducible science. This is why researchers, in spite of the limitations, have settled for the limited degree of prediction achieved by science and if we go by Conant the most that could be achieved is a reduction in the degree of empiricism in social sciences. The following pages are

likewise aimed at reducing empiricism by a certain degree.

Quite a few natural phenomena are so well known that one wonders why the degree of universality of phenomena has not been identified out of the observations starting from the atomic and molecular level to the distribution of the celestial bodies. One can find a relation between the attractive and repulsive forces at the intermolecular level and the inter-stellar forces on the one hand and the likes and dislikes among the living beings, particularly the human species. One could qualitatively suggest that the latter are part of a universal system. It should therefore, be possible to quantitate these observations by applying the laws of physico-chemical sciences to certain analogies in the society. For example, the solvent could be considered as the main society and the emigrant a solute. Assimilation of the emigrant would depend on the nature of the main society as well as the migrant. The deviations in behaviour and acceptability of the latter can be predicted on the basis of the laws of solution. These laws suggest that if the interactions among solute and solvent are uniform, the solution would be ideal. Analogously if the interaction among the components of the society are uniform it would be an ideal society. We do find that the society during the life time of the Prophet (b.p.u.h.) was an ideal society by difinition of the laws of solution. This neat analogy prompted me to look for others.

-v-stupid

Affinity of chemical substances was considered by Newton not to be exactly similar to those of the human beings but the empirical observations and the nature of attraction in the form of kinship were already well known during his times. There are scores of evidences which suggest that human beings interact with one another because of the affinites they may or may not have for one another just like chemical substances. Based on the concept of affinity it should be possible to suggest a mechanism for

*-good ✓

socialization of the human species. The driving force of a reaction is another observation that could be related to the speed with which human interactions nucleate and either result in a revolution or in the domination of one faith over the other.

I have taken advantage of several historical events, either documented in history books or described in the literature on social sciences and have tried to weave in the chemical phenomena, Islamic studies and historical events into a closely knit fabric. How far I have been successful remains to be seen and this will be judged by the comments which I receive from the readers. My hope that the present approach would add new dimensions to sociology is backed up by the comments and encouragements received from Dr. M.A. Kazi, Dr. Mahdihassan, Hakim Mohammad Said, Dr. Jameel Jalibi, Dr. Naeem Ahmad Khan and Mr. Basit Hassan, to whom I owe grateful thanks.

Here I would like to acknowledge my gratitude to Mr. Azmat Ali Khan, for his untiring efforts in the preparation of the manuscript in the present form. Special thanks are also due to M/s Irshad Hussain, Shahabuddin Qureshi, Kamal M. Habib, Ahmad Abdul Hamid, Haseeb Ahmad, Zafar Iqbal Shams, Anis Ahmad, A. Rashid Khan and Baqaullah for their help in giving it a final shape and also to a number of well wishers who prayed for my health and thereby for the completion of the book.

Mirza Arshad Ali Beg

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Chapter I

HUMAN BEHAVIOUR AND PHYSICO-CHEMICAL LAWS

Human behaviour problems are said to be better understood by considering the different actions of man as those of different components of a machine and it is thought that human relations could be improved by methods similar to those adopted for enhancing production from mechanical devices in manufacturing. A manufacturing process constitutes a series of steps through which the materials are transported, assembled, reassembled, passed through different machines and finally given a presentable and acceptable shape. Each of these steps is governed by definite physico-chemical laws. In the manufacture of lime for example, quarrying, crushing and transportation of limestone are governed by simple laws of dynamics; heating and decomposition of limestone into lime and carbon dioxide by chemical laws of equilibrium and finally the packing is again done so by the dynamics. There are definite physico-chemical laws for each of these steps. It might be of interest to note that the laws of physico-chemical and biological sciences have been derived from observations of day-to-day activities of the artisans and empirical practitioners of medicines like the hakims. The observation on the falling of the apple led to the law of Gravitation; the boring of the cannon was observed to generate heat and this change of mechanical to thermal energy was the basis of the first law of thermodynamics, and similarly the empirical observation on effect of chand booti in lowering the blood pressure led to the isolation of serpajmaline.

Empirical as well as experimental observations and analogies among the physico-chemical and biological sciences on the one hand and the scientific study of man as a social animal on the other have shown that in both cases

a uniformity exists and that is the reproducibility of phenomena. The practical knowledge about the behaviour of physical objects has been available to man for a long time. The burning of organic matter and the melting of ore; the dissolving of salt in water and the insolubility of rocks; the softness in the attitude of mother and the authoritarian nature of the father and the likes and dislikes of persons are some of these practical observations.

The likes and dislikes of living beings were compared with the chemical affinities of many compounds. It would appear that a parallelism between human behaviour and physico-chemical interaction has been felt for a long time but the reverse does not seem to have attracted the attention of either the social scientists or the physicists and chemists, possibly because of the compartmentalization of these branches of science into different faculties.

The gradual accumulation of scientific knowledge and further observation and interpretations has slowly changed the atmosphere of understanding. One of the biggest contributions of compilation of these data is that it has made people realize what exactness means. Even a person who may not be emotionally inclined may be convinced by the exact and impartial data in the laboratory. However, it has been questioned in the previous years also as to whether the physical and biological sciences can apply their laws to human activities, that is, to the social sciences.

In order to understand the relation of the study of physics, chemistry and biology with human relations, the experimental methods and results in both cases must be well-known. For this matter the methods of observation in natural sciences and also their results must be known to the social scientist. This would be one of the methods of correlation of the laws of physical sciences with the study of human relations.

In the following pages and subsequent chapters an interpretation of some of the physico-chemical laws like the behaviour of components in a solution as governed by

Raoult's and Henry's laws and the deviations from the ideal behaviour of solutions; the occurrence of equilibria, free energy and the driving force and then the transition state complex formation have been discussed in terms of human behaviour. This is admittedly based on a layman's understanding of Social Science but these interpretations have been attempted in order to introduce the physical concept to the social scientists and if they are applicable at all, there is scope for quantification of the ideas. For example if the study of fugacity is applicable to the escaping tendency of a set of organisms from a certain environment, it could be extended to the process of urbanization. It might be possible to calculate the rate of migration from the rural to the urban areas and later on, the rate of emigration from the country.

Transformation Processes

Human behaviour can be considered analogous to processes involved in the changes that take place when matter transforms from solids to liquids and liquids to gases. Solids melt on heating and form liquids which evaporate on further input of thermal energy and form a gas. The solid state is an ordered arrangement of particles or atoms in the crystal lattice. Liquids are less ordered while the gases are completely disordered. The introduction of heat

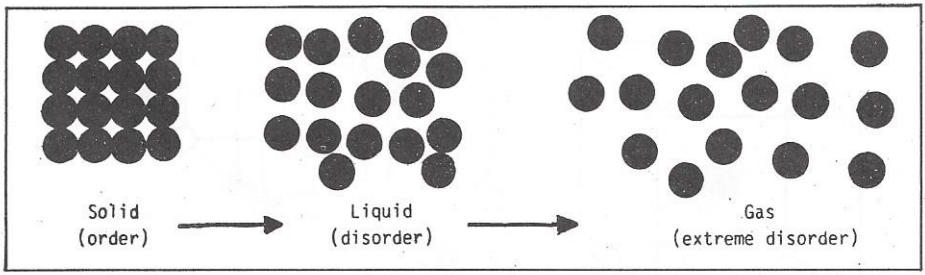


Fig. 1.1 Changes of state and the variation of orderly arrangement of molecules

or thermal energy into a system is a disordering process whereby the lattice arrangement is disturbed gradually until

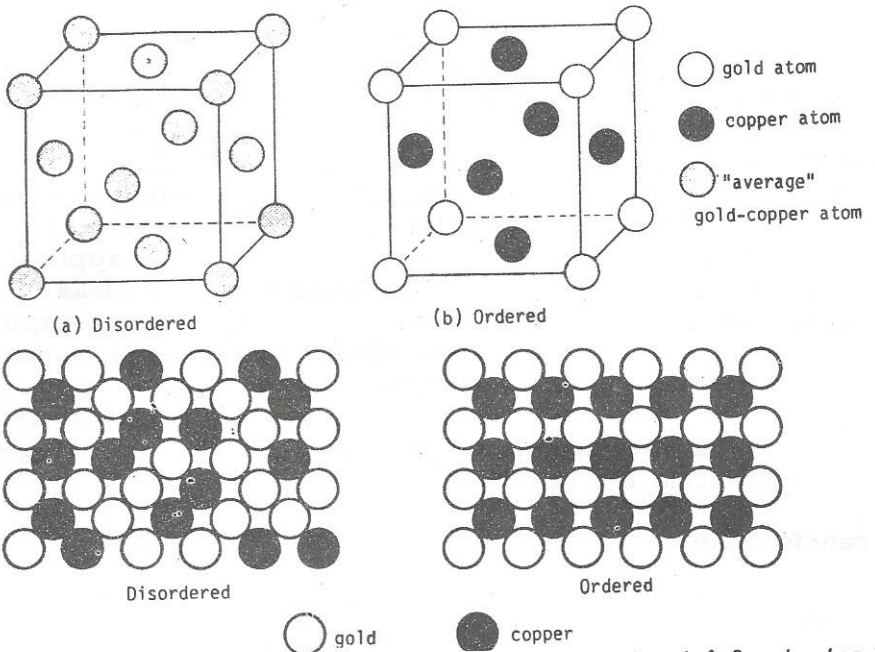


Fig. 1.2 Atom arrangements in disordered and ordered $AuCu_3$ having high and low lattice energy

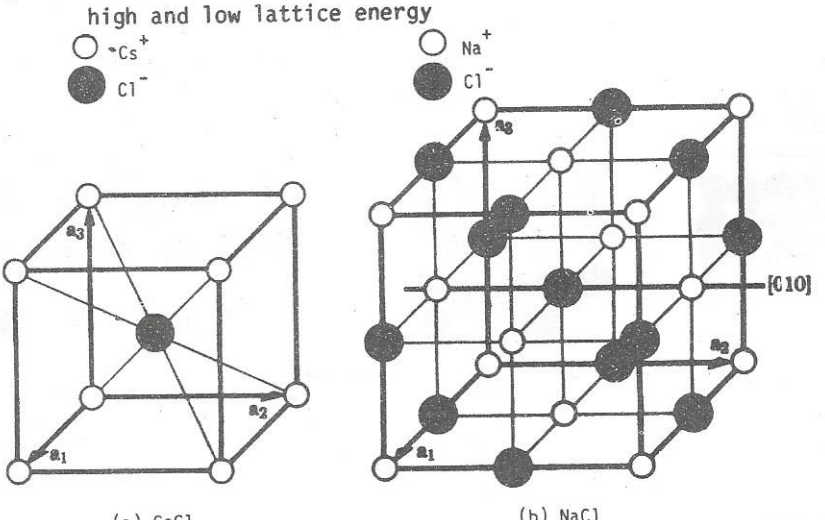


Fig. 1.3 Lattice arrangement of (a) having low melting point and low lattice energy, and (b) having high mp and high lattice energy

it is completely lost at the melting point. The lattice has an assigned position for each of the particles placed therein. A known amount of energy called lattice energy is required to break it down and bring about disorder in the crystal or particle arrangement. Crystals of calcium fluoride or sodium chloride have a high lattice energy and are difficult to break by heating while those of oxalic acid and water i.e. ice have low lattice energy and consequently melt easily.

A society which governs itself with rules and regulations and has established norms to follow can be considered predictable or ordered like crystalline solids. Similar to the characteristic arrangement of atoms in the lattice, there is placement of individuals in a society or in the hierarchy of an organization. The breakdown in an ordered society would be just as much difficult as of the crystals having high lattice energy.

All particles are at complete rest at absolute zero which implies that they have no kinetic energy but when heat is added or energy is supplied to the system, its particles or members start vibrating and/or are set in motion about the lattice point. If heating is continued, increasing thermal vibrations disturb the crystal arrangement and the kinetic motion of the particles also increases; this goes on until the lattice is completely broken and the solid melts giving rise to a disordered arrangement of molecules in the system. The particles vibrate so much at the melting point that the bond between the neighbouring particles is loosened. This loosening of the bond does not increase the kinetic energy but increases the potential energy of the particles, since work is done to overcome the attractive forces between the particles. A peaceful or ordered society would assume a disordered arrangement when a disturbance leading to commotion has been created. Unbearable physical conditions of any kind can bring about a situation in which the forces holding individuals at the appropriate places would be disrupted giving rise to dis-

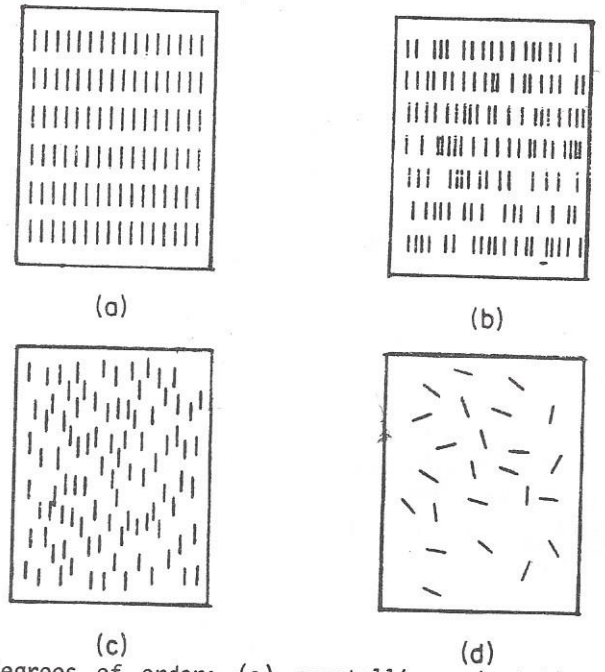


Fig. 1.4 Degrees of order: (a) crystalline-orientation and periodicity; (b) smectic-orientation and arrangement in equispaced planes, but no periodicity within planes; (c) nematic-orientation without periodicity; (d) isotropic fluid-neither orientation nor periodicity

order as is obtained when solids melt to a liquid.

Solids crystallize in different ways and the degree of order changes with arrangement of component species as shown in Fig. 1.4. For the purpose of the present discussion they may be classified as ionic and molecular crystals to which sodium chloride, NaCl and water belong respectively. The amount of heat necessary to melt the well ordered NaCl is 7.25 kcal/mole, while that of the less ordered crystal of ice or solid water is 1.44 kcal/mole. Since this energy is a measure of attractive forces required to overcome the melting process it is obvious that the same is very much higher in NaCl than in water. This suggests that solids or systems having a highly ordered arrangement are less

susceptible to breakdown and more than sufficient energy would be needed to destroy the attractive forces present therein.

Melting point of crystals is usually sharp and its sharpness characterises purity. The energy added for melting introduces small regions of disorder into the crystal and destroys the regular arrangement; the irregularity so created rapidly spreads throughout the lattice. The amount of disorder allowed in a crystal is in a very limited region and only when the limit has exceeded to the entire lattice that melting occurs. Similar forces are operative in a society. It is not possible to introduce small regions of disorder in a well balanced society without at the same time disturbing the total environment. The spread of an epidemic or scare of anti-social elements is contagious. The amount of disorder allowed to be absorbed in a society is also limited. When this limit is exceeded, the cohesive forces holding the components of the society together are weakened. It may be mentioned here that a highly ordered society resists many intrusions and does not yield to disruptive forces easily. On the other hand a disordered society would have a low yield point and would be highly susceptible to attack from anti-social forces. The decay of the once highly cohesive Muslim society described later has been attributed to a disorderly arrangement existing in their fold and it could not withstand the onslaught of the European forces.

Liquids represent a compromise between order and disorder. The thermal motions introduce disorder but they do not completely destroy the regularity of its structure. The liquid obtained on melting the solid is energetically less favourable compared with the solid. An input of energy exceeding the lattice energy is needed in the form of latent heat of fusion to bring about melting. Greater randomness and hence greater entropy, to be discussed later, characterises liquids.

The subjects, in their various shapes, taking part in the socialization process should not be considered as just

individuals of any kind but as complex systems which can be described by properties such as those of solids, liquids and gases. The systems described above are a part of a series but are separated from the rest of it by definite boundaries. The observations on the socialization process record the characteristics of individuals and societies so that they can be described with the required completeness. A complete description defines the state of the system.

Characterization of a system allows one to predict the behaviour of another system with the same set of characteristics. This prediction is possible if the system has attained a state of equilibrium and the latter is said to be attained when it shows no tendency to change its characteristics with time. Systems which have attained mechanical equilibrium have lower potential energy compared with those which are in a position of unstable equilibrium.

Systems undergo changes in the state of aggregation, chemical reactions and temperature changes similar to mechanical changes. When changes take place in a closed system, they result in the establishment of a reversible equilibrium.

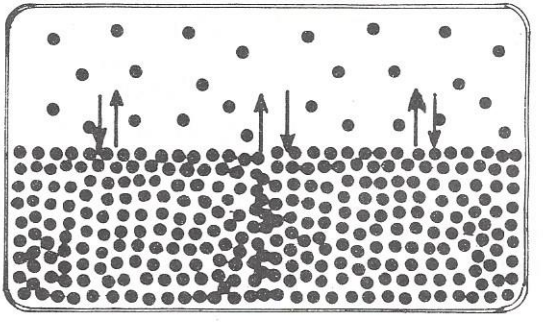


Fig. 1.5 Liquid in equilibrium with its vapour in a closed system

Thus when a liquid is confined in a closed vessel, equilibrium establishes between the liquid and vapour phases and between two reactions viz. evaporation and condensation which are the exact opposite of each other and take place at equal rates. A solid placed in its saturated solution is also in a state of equilibrium since the former dissolves at

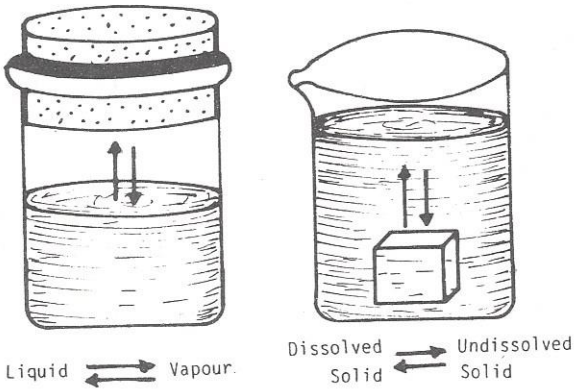


Fig. 1.6 Liquid-vapour and solid solution equilibrium

the same rate at which it crystallizes from solution. These are examples of equilibria in which different states of aggregation are involved and have been discussed in chapters on Solution and Society and Assimilation.

There are chemical changes which are reversible. Hydrogen iodide, for example, decomposes at 400°C into hydrogen and iodine and the last two at the same time combine to form the former. Similarly limestone or calcium carbonate decomposes at 700°C into lime and carbon dioxide and the last two also recombine at this temperature to yield the former.

Chemical reactions of the above kinds are depicted by equations such as (1.1) and (1.2) which equate the

$$2HI \rightleftharpoons H_2 + I_2 \quad \ldots\ldots\ldots\ldots\ldots\ldots (1.1)$$

$$CaCO_3 \rightleftharpoons CaO + CO_2 \quad \ldots\ldots\ldots\ldots\ldots (1.2)$$

smallest number of reacting molecules and the products formed. They at the same time present a picture of the reversibility and reproducibility of the phenomenon. These reactions take place when the smallest units of the reactants and/or products come into actual physical contact with one another. Reactions do not occur every time there is

physical contact or even on a collision between two species. Only certain kinds of molecules react with certain other kinds and there too, only a certain percentage of collisions between molecules would result in interaction. Thus a set of conditions have to be provided so that frequency of collision of molecules of reactants increases and results in increase of reaction velocity. For example substances vary widely in the ease with which they can be set on fire. These are reactions of the combustibles with air. Certain metals easily burn in air but others form an oxide and allow burning with difficulty. Sand, lime and clay do not burn but phosphorus must be stored out of contact with air so that spontaneous fire is prevented. Analogous interactions in societies have been discussed in subsequent chapters, particularly the one on Decline of Societies.

The certainty and rate of reaction depends primarily on the affinity which the reactants have for one another. The rusting of iron, burning of phosphorus and combination of hydrogen with chlorine with explosive violence on exposure to radiation are some examples of high affinity while the inertness of nitrogen and noble gases are cases of substances showing lack of affinity to react under ordinary conditions. Individuals and societies, similarly have their affinities and this is the subject of the chapter on Affinity and Socialization.

The next factor which determines the reaction velocity is the concentration of the reactants. The collision frequency

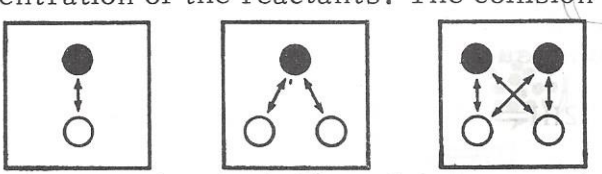


Fig. 1.7 The rate of a chemical reaction is proportional to the molecular concentration of each of the reactants

of A and B, the two species responsible for formation of AB would depend on their number. If their number is doubled, their collision frequency and hence the rate of reaction would also be doubled. This aspect has been dis-

cussed in the chapter on Human Interaction and the Socialization Process.

The rate of chemical reaction increases with an increase in temperature which determines the rate of molecular motion, the higher the temperature the higher the frequency with which molecules collide with each other. Temperature is a measure of the average kinetic energy of molecules and hence of the velocity with which they move. The molecular motion stirs up the molecules and prevents their close packing in their respective state viz. solid, liquid or gas. Accordingly gaseous reactions are more facile than those in liquid or solid state. Social interaction among the highly disordered anti-social elements who can easily be excited can be considered similar to gaseous reactions; the law abiding average middle class reacts like the liquids while the well-ordered society behaves like crystalline solids.

A rise in temperature and a consequent stirring up of the molecules causes an increae in volume but if the volume is fixed there is development of a force normal to the area of the body and is known as pressure. At equilibrium the internal pressure exerted by the body equals that exerted on it by the surroundings. The internal forces comprising intermolecular forces are absent in ideal gases and hence their internal pressure is zero. For imperfect gases it is appreciable but in liquids it is much greater than external pressure. Being the resultant of the forces of attraction and repulsion between molecules in a liquid, it depends on the external pressure and also on polarity of the medium. Liquids having similar internal pressure do not deviate from Raoult's law of solutions. Such liquids which have divergent internal pressure show positive deviation from ideal behaviour and have low miscibility. On the other hand those liquids which show similar internal pressure can even enter into compound formation.

Chemical reactions between different states of matter take place at the boundary or interface of the systems. Stirring and shaking of immiscible substances brings fresh

interfaces and reaction takes place by renewed contact. Unsociable persons do not usually interact but when they are faced with different situations in a group for a sufficiently long time, they do enter into dialogue. Some time pressure has to be used to bring about reaction and the reactants may be interground to bring in a change. Lime and silica for example do not form a silicate unless heated together over 1200°C but if the two are ground together the silicate of lime is obtained. This is similar to a group discussion. Participants of meetings may tend to avoid expressing their point of view but when deliberately asked to do so, they are pressurised to participate and once the inhibition has been overcome, they keep speaking as and when they feel to do so.

One could also suggest that the internal pressure of the passive participants is much lower than the external pressure exerted by the group and hence the former remains unsocial. If the internal pressure is increased or external pressure is decreased, the passivity would be reduced. Similarly for the second situation the pressure of the group does a lot of stirring up of the closely packed ideas, packed by the inner self of the participants, so that their system becomes participative.

Extension of these principles to societies suggests that a disordered society constituting anti-social elements would have large internal pressure which can be brought down by adequate external pressure or regimentation. Gresham's principle in economics that bad money chases good money out of the market can be explained by the application of the internal pressure concept. If there are two currencies of unequal exchange value concurrently in circulation, the one which is inferior is more volatile and may be considered as exercising external pressure. The currency of higher value is usually less volatile and is small in volume. It would succumb to the external pressure as the flow of the former increases. A small region of disorder would, thus, be created in the sub-system where it is first introduced and would spread throughout the

system as the flow of bad money continues on a regular basis. In order to reverse the process the internal pressure of the good money will have to be increased to overcome the external pressure of the inferiors.

Non-availability of basic amenities in rural areas leads to a breakdown of their social environment. This process is comparable with that of the solids towards their melting point. The rural population migrates towards the towns looking for work and even if they do not get an employment, they keep attached to them because of the attractions offered e.g. hospitals, cinemas, freedom from obligations to relatives and chiefs etc. The migrant to the urban centre remains in a liquid state or becomes a part of the disorderly arrangement which is the only one available to him. He has no permanent employment or housing and other amenities and there is a general atmosphere of misery and unrest for such persons. The internal pressure of the villages pushes the workers to a town to find work as domestic servants, clerks, messengers etc. but if the conditions are equally bad in the towns, the worker keeps moving and may settle in a city or may migrate to a neighbouring or else to an advanced country.

Application of pressure on gases compresses their volume and reduces the distance between the molecules which exert pressure on the walls of the vessel containing them. The intermolecular distance reduces to a close packed system in a liquid and the effect of pressure does not alter the distance except that each layer of molecules transmits the pressure to the adjacent layer, thus distributing it equally in all directions. When such a pressure is applied on solids, they yield to the pressure on reaching the limit of compressibility and there is a random breakdown of the lattice.

It is possible to see the effect analogously on the society. Individuals and/or their associations are likely to be easily pressurised if they are not united as is the case with gases. However if they are closely packed or have a unified stand, the pressure on one individual would be

transmitted to the others as is the case with liquids where the applied pressure is transmitted in all directions. On the other hand, if the pressure is on a highly ordered social structure e.g. clergy or a military establishment, there would be severe resistance and if it persists, there would be rupture in the rank by way of killings and destructions.

Melting all the solid and further heating of the melt increases the kinetic energy of the particles and the temperature of the liquid rises thereafter. The temperature goes on rising until the boiling point is reached. At this point extra heat is needed to overcome the attractive forces between neighbouring particles in the liquid state. Here again the potential energy of the particles increases and there is no change in the kinetic energy. During this process the liquid is converted into a gas. Extra heat viz. latent heat of vaporization is much higher than that of fusion. The latent heat of vaporization of water is 11.31 Kcal/mole while that of NaCl is 183 Kcal/mole. These values indicate that the attractive forces between the less ordered system of water molecules are much lower than those between the well ordered sodium chloride molecules.

Evaporation seems comparable to migration e.g. of the flight of migratory birds as soon as the temperatures start rising in the tropics. People start leaving their homes in case they are faced with epidemics, famine, floods or other calamities such as war. Exodus due to epidemics is not so common these days but in the past, plague, cholera, small pox etc. used to take heavy toll of lives and people used to stream out of towns towards less risky places. Famine has been displacing millions of people out of the villages and towns. The one which dislocated the Irish occurred in 1842-7 when 25% population of the country died and another 25% migrated to the USA. The Ethiopians migrated to Sudan in late 1984 and this was followed by a wave of migrants from Chad and Eritria.

War and war like situations also initiate flight of popu-

lation to secure areas. Such situations have surfaced up in Vietnam, Cambodia, Hungary and Afghanistan. Almost 2000 persons per day on an average are in flight from their homes. This can be termed as the evaporation rate of the concerned population. There are a total of 11 million refugees or evaporates on a global basis. Some 15% of the population has vaporised from Afghanistan.

The migratory process in the present context would comprise development of internal pressure in the above situations and having become much higher than external pressure, the traditional linkages with the home are in the first stage shaken to give a disordered state comparable with liquids. The liquid society vaporises when its internal pressure builds up further and in the second stage there is exodus. Exodus from ordered societies requires much higher input of energy as for crystals, compared with those which are less ordered like the liquids. Advanced countries belong to the former category while the developing countries belong to the latter. It is in the latter region that the rate of rural-urban migration is high and so is the exodus to other countries.

The temperature of the liquid at the boiling point remains constant which is the same as that of the vapours. On further heating the kinetic energy of the particles of

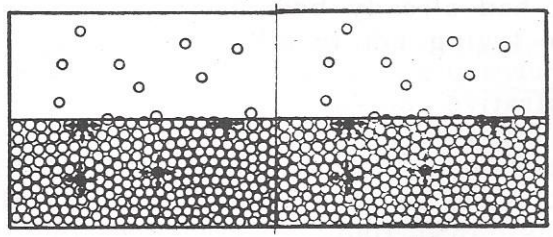


Fig. 1.8 Liquid-vapour interface

the vapours is raised and the temperature of the system starts rising thereafter. The particles get highly energised as the temperature is raised and there is commotion and disorder of the highest degree. One might find such a

process taking place during commotions due to panic or disaster.

An event which could describe the above processes and their relationship with human behaviour occurred at Jallianwala Bagh, Amritsar in 1919. The people of India thought that by helping the British in winning the first World War they deserved a treatment meted to other members of the Empire. However, the wartime restrictions on the Indians continued. Further repressive measures introduced by the rulers yielded a wave of opposition storms. This situation is similar to subjecting the society to high pressure. The Indian society was still in the liquid state in that there was no unity of thought and not much of an order had been introduced into it. The leaders were trying to unite the people or to crystallize the society by calling for meetings, strikes etc.

Protest meetings were being held all over India against the Rowlatt Act and when two leaders namely Mr. Satyapal and Dr. Saifuddin Kitchlew were deported from Amritsar, a protest strike was called to demonstrate unity of thought or that the process of crystallization had started. The 13th April was a Baisakhi day and a 25,000 odd mixed crowd of Hindus, Muslims and Sikhs had gathered at a not too spacious Bagh to celebrate the harvesting festival. Martial Law had already been imposed in Punjab and the British were trying not to allow the Indians to crystallize and were increasing the pressure through military force. The administrative control of Amritsar district was handed over to General Dyer. On the said day, he brought armed soldiers, positioned them on either side of the entrances and ordered them to fire without warning the crowd of his intentions. 1650 rounds were fired in 10 minutes to save India from a second mutiny.

The crowd which had hardly got to crystallizing stage had to evaporate off for life. The 25,000 men surged outward but bullets were directed towards the four or five entrances. They tried to find all the possible outlets to

escape, climbing up the walls, jumping down into wells, entering sewerage drains etc. This serves as an example of heating a liquid under pressure and of human beings bursting out under great stress and scare of death through various openings, large or small. 400 persons were killed and 1200 were wounded on the spot. The remaining 23,000 odd left the ground within 10 minutes in the same manner as a low boiling liquid would evaporate off under high temperatures leaving behind residues which have no external pressure.

The reverse of the evaporation processes takes place when the gases are cooled or when the source of heat is removed. Heat is withdrawn during the cooling process and kinetic energy of the particles also decreases. The motion of the particles slows down and so reduced that the attractive forces become predominant. At this point the particles start coalescing and form a liquid. This process releases energy and there is a decrease of potential energy. Thus at the time of liquefaction the temperature does not fall nor do the particles slow down their motion. The kinetic energy of the particles at this temperature is the same in both phases. There is a decrease in kinetic energy when the liquid is cooled further. The thermal motion of the particles is gradually reduced until the point of crystallization or solid formation is reached.

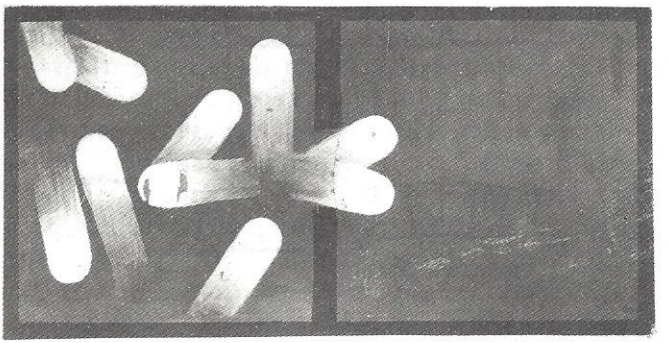


Fig. 1.9 Sudden expansion of a gas

The particles start lining up in a definite pattern as liquids start solidifying and thus their freedom of motion is substantially reduced. The potential energy of the particles drops as the particles take their position in the crystal lattice. It is only when all the particles have crystallized that there is a further drop of temperature, if the cooling process of solid continues.

This phenomenon is comparable to the state of migrants who settle down at their destined points. If the migrants have internal pressure comparable with that of the majority population, there would be very little tendency to deviate from their normal behaviour. Between the two communities,

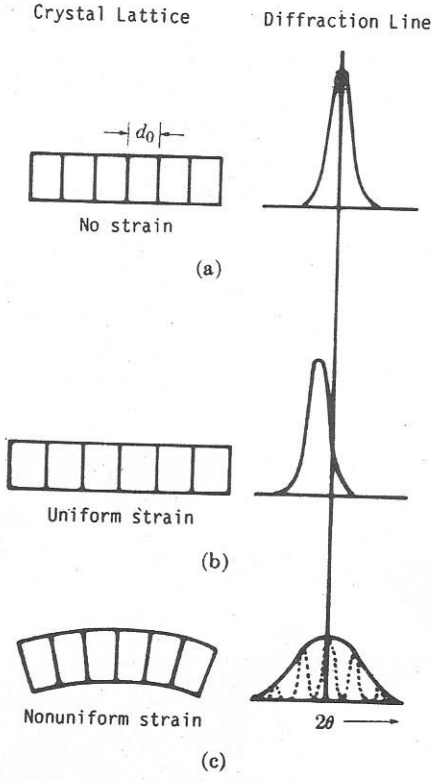


Fig. 1.11 Lattice strains and their detection by the position and width of diffraction line

there would be positive deviation from non-acceptance by the majority, and negative deviation in case of acceptance.

Application of force on a body to change its length, volume or shape causes strains. The force per unit area is called stress. The deformation of a body or the strain is directly proportional to the force or stress. The ratio between stress and strain is constant for a substance. Strain in crystals can be identified as in Fig.(1.11) and metal fatigue which is a failure of the metallic system to carry on with the assigned mechanism is one way of deformation of such long lasting substances.

Human systems can undertake considerable stresses and the deformations or strains appear in the form of muscular or mental fatigue, delirium, nervous breakdown, blood pressure or heart failure. Human body can withstand reasonable stresses due to temperature, pressure, mechanical stretching, bending etc. For example it can adjust to temperatures slightly higher or lower than the body temperature of 37°C but if exposed to high heat or cold, the body is unable to adjust and suffers from sun stroke or cold, cough or pneumonia. Man has during the course of time learnt to adjust to the stresses due to changes in the physical environment by setting up controls e.g. by mastering the air for speedy travel, the ocean for mass transportation, the rivers for control of floods and an assured supply of water. It is possible to achieve affluence and enjoy a high quality life which provides different luxuries at each stage of desire. But these very stages of aspiration create stresses and since they deal with ones mental set up, one may or may not cope with the resultant strains. These situations are being created because the opportunities are too few and sky is the limit for desires. This is one of the main reasons that the impoverished environment of the resource-poor countries creates a pseudo affluent society with a high ratio of stress/strain.

There is a profound effect of the environmental stress on the formation of crystals and the variation in the rate

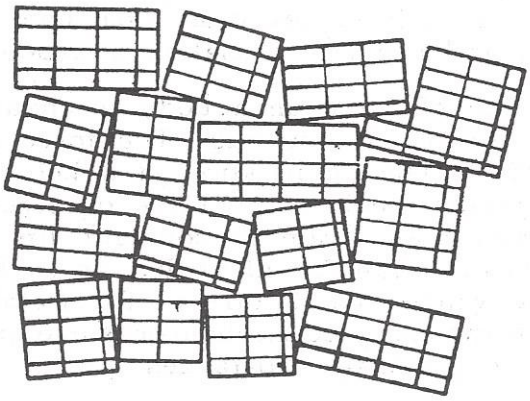


Fig. 1.12 The mosaic structure of a real crystal

of deposition of solids can completely change their form or habit. Calcium carbonate deposited in the cold solution is fine and well developed but in a hot solution it is coarse and irregular. Sodium chloride deposits as cubes in pure aqueous solutions but it assumes an octahedral form in a 15% urea solution. Likewise environmental conditions determine the human behaviour with regard to settlement. The migrants for example would tend to settle on the premises where they have their kins or clan or their countrymen, who form the nucleus for the coalescing of migrants as do the particles towards the point of crystallization. The community grows larger as more migrants come in. If the settlement process is too rapid, there would be no time for a planned housing and slums described by the formation of coarse grained solids would spring up. Otherwise, given time, well planned societies or colonies would shape up.

The slums may in general be described by a semi-solid state where a desired crystal form has not emerged. Impurities reduce the melting point and a disorderly environment is likely to have a higher heat content. Anti-social elements or impurities of the societies would similarly not allow orderly arrangements. Crystal formation tendency would be lowered and a peaceful environment would be less likely. The slum, consequently, has a high incidence of robbery,

murder and other evils. It would therefore take a long time to crystallize or civilise the persons concerned.

The formation of the Islamic society at the outset was a crystallization process. A well developed crystal-like society was carved out of an uncivilized liquidus prevailing at the time when the Prophet (p.b.u.h.) started his mission. Those who belonged to the liquidus but were desiring to be converted to Muslims usually posed questions to enquire as to what would become of the sins committed by them before their accepting Islam. The Prophet (p.b.u.h.) preached them to beg forgivings (Tauba) from God and this act alone would purify them if He so wishes. They acted accordingly and thus the crystallization process set in to yield an ideal society.

The great Caliph Omer Bin Khattab was so highly enraged at the news of his sister having accepted Islam that he vowed to kill her. The heat content of such an enraged person can be assumed to be tremendous. The internal pressure of his system was obviously very high. However, on approaching her house and listening to the recitation of the verses of the Quran he not only cooled down but through the teachings of the Prophet (p.b.u.h.) he got crystallized into a structure with such a super-lattice that he became one of his best companions and was responsible for bringing order among the society of infidels inhabiting the land from India to Spain.

History is replete with examples of processes involving purification by crystallization. A chemist feels very happy when he obtains crystals from a solution because they are characteristic of purity. Similarly a society is delighted when some one from among themselves attains recognition which is analogous to crystallization from a solution. The great leaders of very many nations worked upwards to the heights of their achievement from a low base. Similar is also the case of a number of scientists, artists, poets who have risen from impoverished societies and their attainment can be described as a process of crystallization.

Consideration of the human behaviour processes mentioned above suggests a general reproducibility of the phenomena which is a necessary requirement of physical sciences. The discussions in subsequent pages add a new dimension to sociology since it would be found that physico-chemical laws can be extended to a variety of human relations and interactions. It must, however, be admitted that deriving information on behaviour from chemical principles may be difficult, if not impossible, in most cases. Nevertheless compilation of chemical facts and observable human behaviour data could provide a strong base for the universal application of physico-chemical laws.

Chapter II

SOLUTIONS AND THE SOCIETY

The major assumption brought forward so far is that individuals and societies be considered as complex systems characterized by properties such as those of gases, liquids and solids. Societies have developed by interaction of individuals through physical and biological processes and their present shape is complicated by migration, distribution, interbreeding and similar processes. Societies consist of individuals and can be described by properties of solutions.

An individual in a society is like a drop in a glass of water or a molecule in a drop. One molecule cannot be identified from the other, yet there are scores of interacting forces on each molecule, in this case the smallest particle of water, which is incapable of independent existence without these forces. The interacting forces are both attractive and repulsive.

The smallest unit of a society, an individual, is incapable of independent existence by virtue of his being a social animal and there are a large number of interacting constraints on him. If we compare this situation with the properties of water it will be found that the presence of interacting forces which in this case are cohesive in nature, has completely changed its properties. In the absence of such cohesive forces, water may not even be a liquid, it should have been a gas boiling at -90°C. The presence of cohesive forces makes the difference. Water is therefore a sociable or associated liquid, a case analogous with the social constraints on an individual which demand that he should be part of a society.

Pure water is hard to find and it always exists as a solution of one or more components. Similarly, only one type of individuals does not form a society. The properties of solutions are governed by Raoult's and Henry's laws, according to which an ideal solution is one in which there is complete uniformity of cohesive forces. An ideal society analogously is one in which there is complete harmony among the individuals. If A and B are two components of the society consisting of a group of As and Bs, then complete harmony would be achieved if the interacting forces between A and A, B and B and A and B are all the same, that is if the likes and dislikes of the individuals are the same.

An individual in a society is guided by both positive and negative forces. His actions and emotions are governed by his desires and fears. The desires are usually for power, status and recognition, and fears may be anything which may pose a threat to his desires and self-esteem. The desires or wants may be considered as positive forces which motivate a person to work for the attainment of an objective. On the other hand fears, threats and aversions are negative forces which inhibit an individual or repel him away from the goal.

These positive and negative forces constitute the initiating and sustaining forces of behaviour, i.e. the interacting constraints on an individual. The desires for an attractive object induces him (or her) to acquire it, while the fear from a dangerous object motivates him to escape from it. Activities like perception, thinking, feeling, activating old habits, and forming new habits are all influenced by wants which impel a person to achieve his goal.

If the analogy of the society with a solution is to be carried any further, some of the other properties may have to be looked into. The vaporization of the liquid into a gas, the conversion of water into steam and its solidification into ice are some such properties which will be dealt with in a subsequent section. For the present it may be mentioned that the solutions maintain the properties of the

solvent with variations caused by the presence of different solutes or components.

Ideal Society

The property of great importance in the description of a solution is vapour pressure of the component above the solution. The partial vapour pressure of the component is related actually to its tendency to escape from the solution and it has been used as a measure of the latter. The escaping tendency called fugacity is governed by physical conditions of the solution. There are three parameters which determine the escaping tendency or partial vapour pressure of the components and they are temperature, pressure and concentration. Consideration of the effect of temperature is being deferred for later sections and only concentration is being discussed here.

It is possible to visualize the effect of concentration of the component on its escaping tendency from the solution. For an ideal solution this tendency or fugacity is proportional to the mole fraction (moles of solute divided by the total number of moles of all components) of that component in solution. Considering this on a molecular scale by assuming a solution of A and B, ideality demands that a molecule of A in this solution will have the same tendency to escape into vapour whether it is surrounded entirely by A molecules, entirely by B or partly by A and partly by B. This implies that the intermolecular forces between A and A, B,and B and A and B are essentially the same, irrespective of their immediate neighbours. Thus,the escaping tendency of the component A from the ideal solution is the same as that from pure A except that it would be proportionately reduced due to its lowered fraction in it. The escaping tendency is related to activity which is the ratio of fugacity to the fugacity in the standard state.

In applying the concept of escaping tendency to the society, an analogy becomes apparent. The ideal society composed of A and B components will have complete harmony due to the similarity of interacting forces between them.

In such a case the escaping tendency of the individuals from the system would be proportional to the number of the individuals constituting the society. Such a society was present at the time of Prophet Muhammad (peace be upon him). This society was composed of Quraish, Ansars, Habashis, etc. The cohesive force of Islam between the Quraish, Ansars or Habashis was the same and it was impossible to distinguish one Sahabi (companion) from the other. Consequently, when they went out of their camps, for tabligh or for jehad, they were composed of all the representatives of the clans and no one was given preference. The maximum activity was therefore achieved at that time since the fugacity under ordinary conditions was the same as in the ideal case.

The Buddhist society furnishes another example of an ideal society. The activity for the Buddhists was maximum because their religion does not preach heterogeneity and hence their fugacity compared with the ideal state fugacity was the same. The Hindus, on the other hand, were a heterogenous society and therefore their fugacity was not related to the components of the society. Their fugacity was at the most proportional to the Brahmins who claimed to be above every one else. They were at the top in the status diagram and hence it is not surprising if their activity was the minimum. This furnishes a quantitative basis for the reign of the Buddhists, the Sultanate, the Moghals and finally the British over the Indian subcontinent.

The British, during the sixteenth to eighteenth century present yet another system, which attained maximum activity. The fugacity of the masses was proportional to the components of their society. The traders, soldiers or missionaries all came out to establish their foothold. It was difficult to distinguish one from the other so far as their goal was concerned and they achieved it by the establishment of the British empire.

Pakistani society does not present itself as a homogeneous society. The escaping tendency is different for the

different components of the society and is also not proportional to their concentration. The fugacity compared with the ideal i.e. the condition where there is maximum coherence, is therefore low, implying that the activity of this nation would also be low. The interactions among the different components of this society, are not at all equal. The cohesive forces are lacking and this is not an ideal society. The Bengalese, however, built up a strong cohesive force among themselves. One Bengali could not be distinguished from the other in the achievement of their goal, which was Bangla Desh. This formed an ideal society and hence there was success. On the other hand different nationalities are asserting their sense of deprivation because they are under-represented in the running of national affairs in Pakistan. In the forces, for example, an overwhelming percentage of troops in the services comes from Punjab province followed by North West Frontier Province, Sind and Baluchistan contributing 65%, 20%, 10% and 5% respectively. The principles of fugacity in an ideal society suggest that they should be in accord with the percentage distribution of their population which is 56%, 13%, 23% and 8% respectively. It is obvious that there is imbalance in representation and hence in the efforts towards national integration. The activity or the collective output is likely to be low because regional interest dominates over national interest. This is also perhaps one of the main reasons for regional interests prevailing over national interests in a national assembly elected on the basis of proportionate population and party system.

The election to National Assembly carried out on non-party basis appears to be fairly representative of the professional affiliations since among the 237 members, it has 7 educationists (2.9%), 16 industrialists (6.7%), 122 agriculturists (51.4%), 34 businessmen (14.3%), 27 lawyers (11.4%), 9 engineers (3.8%), 13 ulemas (5.5.%), 4 doctors (1.7%) and 5 journalists (2.1%).

The estimated sectoral employment as of 1983-84 is agriculture 51.9%, manufacture 14.9%, teaching 1.5%, construction 5.7%, business 11.7% and services 14.3%. It may

be seen that agriculturists, educationists, businessmen and engineers forming 70% of the force are proportionately represented in the assembly and conform to the laws just stated. However, the agriculturists who form the majority represent the top stratum of the 8% landlords holding over 10 hectares land and do not really belong to the majority of agriculturists who either own no land or a maximum of 10 hectares. The Pakistani society is therefore not the ideal type to yield maximum activity as was obtained at the time of the emergence of Islam, or of Buddhism etc. and the output is likely to be low.

The disproportionate structure of the United Nations General Assembly and concentration of power in the hands of super-powers, who desire to continue ruling the less developed nations by offering least favourable terms of trade, aid packages and alliances, is similarly unable to yield positive results to benefit humanity.

One could examine the question of proportionate representation in parliament for a few countries to see if it can be related to assimilation. The very basis of proportionate representation suggests labelling of identity. As soon as the process of identification takes roots, extra efforts would be needed to integrate the various units and useful work would not be obtained. In general one has to work for the assimilation of small units into the majority and the society has to spend extra energy for the integration process. The electoral process of 1945-46 proved the identity of Muslims of India and Pakistan was created, the very next year.

The overwhelming majority of the Indian Muslims voted for Muslim League and for its demand for creating Pakistan i.e. for an independent identity in the area where Muslims formed a majority. If the Muslims had not done so the brute majority of Hindus would have assimilated them in the years to come. The democratic process creates a sense of nationalism and divides humanity and therefore the Muslim leaders of the time correctly assessed the situation that they could not maintain their identity as Muslims and were

by all definitions not among those who could be dissolved into the Hindu majority either by pressure or temperature, the two conditions for increasing the solubility or assimilation. While the Indian National Congress demanded the British to quit India, the demand of the Muslim League was that they should divide and quit.

Two nations were created due to pressures of the above kind. The Indians adopted a constitution for their country within two years but the Pakistanis took nine years to agree to a draft constitution. The assembly was, however, dissolved and the outcome of the long and enduring process of constitution making was scrapped.

One of the evils of the democratic processes was the adoption of the joint electorate system by which the Hindus in Pakistan instead of being given proportionate representation were allowed to participate collectively. If the country was carved out on the basis of religion, the principles of the two nation theory should have been upheld. This was not done and the 1970 elections were held on party basis and Hindus were allowed to vote for Muslims. Unnatural as it would seem in the light of the laws of solution, there was no question of Muslims or Hindus proportionately representing the cause of one another. The elections were based on 1961 population census according to which East Pakistan had 50,840,235 persons of whom 9,949,754 were non-Muslims while West Pakistan had a total population of 45,380,378 and 1,214,255 out of them were non-Muslims. The difference in the Muslim population between East and West Pakistan was 3,275,472. The results of election in East Pakistan were: a total of 54% votes were cast of which 34% were by the Muslims and 20% by the Hindus; Awami League or peoples party, the winning party received 34% votes whereas Jamaate Islami, the fundamentalists got only 20%. Thus the Awami League won not only because of the 20% Hindu votes but also because of the 46% absentees a large number of whom were Muslims who were either indifferent or did not apprehend the catestrophe ahead. In any case unless the elections ensure all out participation,

they do not reflect true representation, or the real will of the people and they can lead to disastrous consequences e.g. the separation of East Pakistan. The Hindus, because of their better political consciousness, were fully participative but the Muslims, comprising a majority of illiterates did not have the will to get representation of their choice or were indifferent to obtaining it.

The 46% non-participative members of the society in East Pakistan did not have motivation or the vapour pressure as is true of traditional societies to come off their set pattern of life and have low fugacity. This does reflect on the true character of the society and should be taken into consideration in deciding the fate of the entire nation.

The elections in West Pakistan were contested in 1970 by a number of parties chief among them being the socialists and fundamentalists, the latter having several components. As stated earlier, the democratic processes create identities, divide humanity and lead to heterogeneity as against homogenity which alone promotes cohesive forces among the various components to give an ideal society. In the absence of a strong national cohesive force binding East and West Pakistan different parties were putting forward different versions to the objectives of an Islamic state and there was no unity and/or coordination of ideas. The election results identified various groups and votes were distributed among them in proportion to their aspirations. The Peoples Party won because it got relatively higher votes compared with the individual and not all of them combined. In West Pakistan also the absentees who did not cast their votes were in majority viz. 52, the Peoples Party received 23% while the rest of the parties put together secured 25% votes. The proportional distribution was disturbed by the low fugacity of the non-participants both in East and West Pakistan and hence a truly representative Assembly was not voted to power. The already not-so-strong cohesive force between East and West Pakistan weakened further and the two provinces became two different nations.

Fugacity

The escape of an individual from a society as well as his migration to and absorption by a different society can be related to vapour pressure of solution. The reverse of evaporation is condensation as in equation (2.1).

$$\text{Liquid} + \text{Heat} \underset{\text{Condensation}}{\overset{\text{Vaporization}}{\rightleftharpoons}} \text{Vapour} \quad \ldots\ldots\ldots\ldots (2.1)$$

The process of condensation of vapours evaporated from solution containing A into another solution containing A and B and the passage of A into the latter solution with a maximum loss of its identity should in essence constitute the process of migration from a society.

The escaping tendency of an individual from a society could be described by a process similar to the escape of vapours from pure water and its condensation into a solution of slat-in-water. If two beakers, one containing pure water and the other containing salt-in-water solution are placed in a bell jar, it is observed that water evaporates more

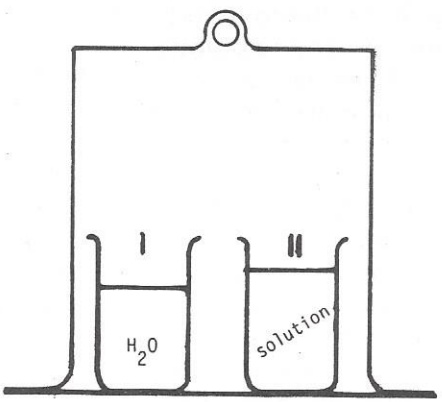


Fig. 2.1 Comparison of escaping tendency of water from pure water and an aqueous solution

rapidly from the beaker containing pure water, than it does from the salt solution. The enclosed space of the bell jar becomes saturated with water vapour when the condition of equilibrium between evaporation and condensation is reached. However, when such a concentration of water vapour is attained, the rate of condensation of water in the salt solution is greater than its own evaporation. The system is not in equilibrium since evaporation from pure water exceeds condensation, while condensation of vapour in solution exceeds evaporation. The vapours escaping from pure water are not only condensed and absorbed by salt-in-water solution but assimilated by it without making any distinction between the water from pure water and that in solution already.

The physical condition in a living environment determines the life style of the people there. If their basic needs are fulfilled and if they enjoy the necessary freedom, they would be contented to live there otherwise they would leave their places for good. In the former case members belonging to other like minded communities might be tempted to move in and might like to join the people there in enjoying their prosperous environment. Supposing a prosperous territory X is discovered somewhere, different persons would move in for exploitation of resources, trade and commerce and to settle there. Such was the case of the Europeans who migrated to America by the hundreds as soon as the continent was discovered. The partial vapour pressure of the components or more appropriately the partial population pressure of the communities already living in country X, in this case America, would have been low, so that condensation of other communities was possible there. Contrarily the escaping tendency or the population pressure in a territory Y, would be high in case the living conditions are below acceptable standards, for example, if opportunities are limited as is the case of the less developed countries. The escaping tendency would be higher than the previous case if the basic needs are not available e.g. persons living in the rural areas of Pakistan

whose per capita income is at least 38 to 40% lower than the urban dwellers. The urban construction labour gets in one months time what he would not get in the whole year as a farm worker. The general poverty in the rural areas pushes the rural population to the urban centres which provide the pull forces. The escaping tendency of rural population is almost equivalent to its pressure prevailing due to the push forces.

The escaping tendency would be higher than the rural-urban migration if the basic needs are simply not available i.e. if water is scarce, the food supply is limited and rain is not likely to help ameliorate the situation as is the case in the Sahel region, and there would be mass migration. It would be the highest in cases of hazards e.g. if there is fire in the neighbourhood, or earthquake or war in the area when every creature in the vicinity would be scared and would run for life. In this case the population pressure would be extremely high and so would be the escaping tendency.

HCR theory

An interesting analogy with (2.1) is equation (2.2). It is true that every society faced with a hazard has at

$$\text{Society} + \text{Scare of hazards} \rightleftharpoons \text{Refugees} \quad \ldots\ldots (2.2)$$

least some if not all of its members, who become so scared that they leave the calamity stricken area without delay. There were two incidents in Karachi recently which illustrate the varying impact of a scare on different persons and the resultant escape method adopted by them. In one incident there was an earthquake and some of the multi-storeyed offices were vacated by the officials within a few seconds. The occupants rushed to the stairway which was jammed. One of them was so scared that he jumped off the window and broke quite a few of his bones. There were a lot of others who remained undisturbed. In the other incident there was a bomb explosion followed by fire in an office. Quite a few persons went up the stairs and got trapped on the roof top but there was one person who jumped off the fifth floor and killed himself.

The above are some cases of flight due to panic which excites a number of persons to leave the scene in a few seconds. In the recent belly landing of Boeing at Islamabad, for example, the plane was evacuated by 240 persons in 90 seconds. In case of war and drought, however, there is a time lag and the affected persons leave their hearth and home as migrants. In 1939 the Spanish Republicans crossed the Pyrenees in the middle of winter to take refuge in France after having been defeated in the civil war. The French were not very kind to the Spaniards who had to face a lot of difficulty in getting themselves absorbed/ assimilated. In 1940 Belgians and French living in the area bordering Germany had to flee in complete disorder and they could find very little shelter almost throughout the War days. In 1942-43 some 30,000 French-men had to cross the Pyrenees into Spain after their country had been occupied by Germany and they were put in prison or into concentration camps.

During recent times there are examples of countries, like Pakistan, Thailand, Sudan, Somalia, Mexico, which are piling up refugees by the millions who depend on the goodwill of the local population and International Agencies which make their living possible, although in miserable conditions. Ethiopia has had to face 17 successive years of drought, the severest in the sub-Sahara African region for 150 years and the Sudanese had to save the life of nearly 8 million people struck by hunger.

The escaping tendency, in the above cases may appear as simple change of places in which only behaviour of individuals looking for better prospects is of concern. This is similar to the small vapour pressure which every liquid has even at low temperatures. This subject would be discussed in the next section on Rural-Urban Migration. The migratory process may in general appear either as selective migration if a certain freedom is denied as in the case of Afghanistan or mass migration, if the needs are not satisfied as in the Sahel region. Selective migration affects only certain members of a component and may not be as wide-

spread as mass migration. The latter can be viewed similar to boiling when the input of heat creates such intensive molecular motion that the molecules leave the system after changing to the vapour state. The escaping tendency of all the molecules in the system increases as the temperature is raised and they leave in a rush. This is collective behaviour in contrast with individual behaviour as suggested for selective migration. The former occurs in cases of catastrophes like earthquakes, floods, fires, wars, etc. when human behaviour is the same as that of any other living being, for example, the flight of herds of animals or flocks of birds. Such laws of solution would be applicable to the escaping tendency of individuals from societies as are valid for higher temperature ranges when massive evaporation takes place and the components in solution have uniform escaping tendency, which is proportional to their concentration.

It need not be emphasized that even in boiling, not every particle of the liquid distills over or gets evaporated. Some molecules leave early while few others are the last to do so. A similar situation is created in the case of

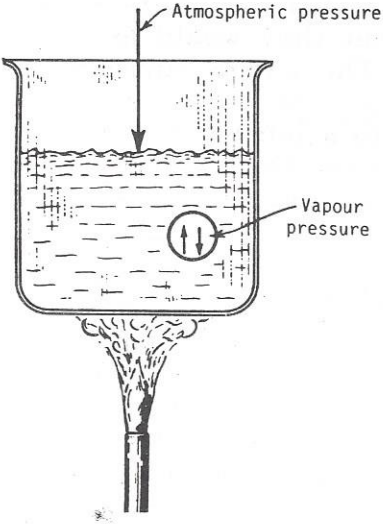


Fig. 2.2 A liquid boiling in an open vessel

panic faced, by living beings. In both cases species directly affected by heat or agitation are the first to go. In the process of boiling local heat transforms the molecule in the immediate vicinity of the point where heat is transmitted into a gas bubble which rises to the surface. During the course of its travel upward, it loses heat to its neighbours and to whatever comes in contact. With the continuation of heating, the process is repeated for all the species present until heat is uniformly distributed throughout the system. During the process of heating a certain vapour pressure is always exerted above the liquid surface and the vapour contains a proportional mixture of the components in solution. The process continues until the system reaches boiling point when the vapour pressure is the same as the atmospheric pressure and there is massive evaporation.

The mechanism of evaporation and of migration, is apparently the same, i.e. the species directly affected are the carriers of heat or agitation. In emergencies such as war there is general panic and commotion but those directly affected are the first to get excited and they create a stir. They are passified by others in the surrounding and are calmed down but they would lose patience if the emergency continues. The entire surrounding is then affected and the whole mass has to leave the place. The analogy can be extended to a number of migratory processes such as those of the birds from the Arctic or of the herds in the Savannas or of war refugees or fire or earthquake victims.

Rural-Urban Migration:

All liquids and solutions evaporate at their characteristic rate when left in the open. Their evaporation is an indication of the escape of molecules into the air above the liquid overcoming the intermolecular forces of attraction. If enclosed in a vessel the vapours exert the pressure equivalent to the vapour pressure of the liquid at the given temperature. For example, water has a vapour pressure

of 50 mm at 35°C. One cubic mile of air over a water body contains its vapour equivalent to 35 million gallons of water.

The escaping tendency of individuals from a society could, by analogy, be considered as a normal behaviour. However, rural-urban migration should be viewed as evaporation at higher temperature since it is more than the normal rate, as is the situation in developing countries, where the migration of population from the rural to urban areas is a result of the large push and pull forces or repulsive and attractive forces present in the two societies respectively. The repulsive forces in rural areas have been generated by extreme paucity of resources. The deplorable conditions prevailing there present a case of a solution where repulsive forces are predominant. There is little attraction, if at all, for an average young person in a rural environment to spend the rest of his life there; hence the escaping tendency of such a person is higher than that of his parents. The difficult living conditions in rural areas make a person, particularly the one who is emotionally demotivated to lose affinity for the environment. Loss of affinity or cohesiveness in physico-chemical sense implies promotion of fugacity. This can be depicted by equation (2.3) which is a modification of (2.2)

Society + Unbearable environmental conditions ⟶ Fugacity.....(2.3)

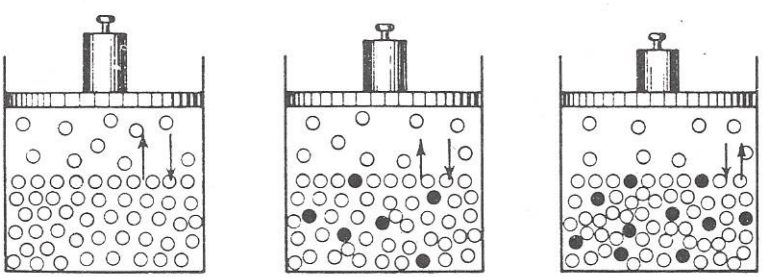


Fig. 2.3 The vapour pressure lowering is proportional to the molecular concentration of the solute

Fugacity of components of a solution can be controlled by (i) reducing the heat of interaction, for example, by cooling to lower the vapour pressure, (ii) applying pressure or putting a lid on the vessel containing the solution to restrict the escape of vapours or (iii) putting another solute into the solution, i.e. by creating a competitive situation.

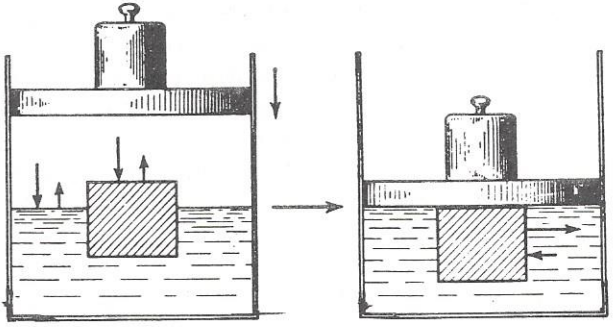


Fig. 2.4. The effect of pressure on the melting point of ice

High internal pressures in a society result in a high escaping tendency even for involatile components, which in the case of the migrating population is analogous to creation of push forces. In case the heat of interaction is high, the volatile components assume high fugacity rates. The effect of lowering of the heat of interaction is observed in reduction of vapour pressure and hence of the escaping tendency.

Applying external pressure e.g. by putting a lid on the vessel which is the second method to control fugacity, seems similar to lack of Government action or society's sanctions. The latter are methods which could contain the adventurist or the fugaceous persons in the same environment.

The third method is the ideal condition in which affinity among the different components would restrict fugacity as was noted from Fig. 2.1. The absence of these restraining forces are apparent in the global event of rural-urban migration because the formation of the cities the world over is going on at a very high rate. There were only

six cities with a population of five million or more in 1950 and their combined population was 42 million; in 1980 there were 26 such cities having a total population of 252 million. In the case of Pakistan, there were only two cities having a population of above 0.5 million; there are now 7 cities with as many people. The growth of large cities is going on unabated even in China and Russia where in spite of their centrally controlled economies they increased from 38 and 25 to 78 and 50 respectively. It has, however, levelled off in the case of Britain where the number of cities with over 0.5 million increased from 15 to 17. In the case of USA, it has risen only by 50% from 40 to 65, while in developing countries like India, Pakistan and Nigeria their number has gone up by 3 to 4 times.

A hard pressed but ambitious person in the rural areas after getting tired of the lithargic village life aspires for migrating to the cities which, to him, represent good life. Its bright lights, high living, attractive jobs, and easy money are the sources of natural attraction as against peasant life. After having migrated, the hopes of the bulk of migrants are shattered but still quite a majority of them are fortunate to get some sort of job which is enough incentive for others to follow and they crowd the urban areas. The result is that the cities develop tremendous population pressure and they are exploding into bits. The formation of suburban communities is just one of the examples of the explosive situation.

The cities of the past had a long and glorious record in human history. When commerce became known to man, trading centres became a significant part of his life. Towns and cities started being developed wherever such activities were intense e.g. a port became a venue for a maritime city. Cities were synonymous with seat of administration, location of power and wealth. It was a home of art and science and symbolised a centre of civilization. They were founded by conquerors and a number of them were a result of their dreams. Asian cities like, Karachi, Bombay, Calcutta, Hongkong were fishing villages before the western

traders-cum-colonialists landed there.

Cities of the past were a source of attraction for the well to do country-dwellers or landlords and aspirations were sufficiently compartmentalised to restrict the average country-dweller to the rural areas. Moreover, living in the cities, walled for fortification, subjected the concerned population to the hazards of invading forces who many a time plundered and razed the capitals of their enemies. Nature also destroyed the cities by vagaries of floods, epidemics, etc.

Industrialization gave a new turn to urbanization and with advancing knowledge man became able to control epidemics and contain other major disasters like floods. Wars are no longer conventional, based on conquering citadels and forts and cities have become safe to live in. Infrastructure facilities are now available in and around the cities which is one of the major requirements for the establishment of industries and hence cities have become major industrial centres inviting rural population to migrate. Because of these reasons the world urban population doubled in 25 years after the Second World War and may double again by the end of the century.

Scores of persons, after having migrated to the city, do not remain contented with what they get there and keep interacting with other persons and agencies so as to condense their desires and in doing so may even be induced to migrate from the country to a different environment in another country.

The escaping tendency is different for the different components of the society and is not proportional to their concentration mainly because some of them are more volatile than the others, who may be traditionalists. The fugacity compared with the ideal, where there is uniform coherence, is therefore high, implying that the activity of such a nation would be low. The interactions among the different components of this society are disbalanced. The cohesive rces are lacking, which suggests that it is not an ideal

society considered in physico-chemical terms. People, under the circumstances, are not contented with the little share that they get. They are naturally looking for affluence for which they migrated to the cities and since it is not possible to achieve it with the meagre resources in the developing countries, it becomes the main reason for the emigration of the population to other countries.

A quantitative statement of the urbanization problem in Pakistan, is possible in terms of physical laws. The rate of growth of the urban population is 5%, while that of the rural areas is only 2.7%. The latter is 0.5% lower than the average for the country. Since the birth rate in the rural areas is the same, if not higher than in the urban areas, the slightly lower rate would be assigned to rural-urban migration. This is borne out by Table 1.

TABLE-1

POPULATION IN URBAN AND RURAL AREAS

	1951 Population	% share	1961 Population	%share	1972 Population	% share	1981 Population	% share
Pakistan	33,740	100	42,880	100	65,309	100	84,253	100
Rural	27,785	82.4	33,225	77.5	48,716	71.6	60,412	71.70
Urban	5,955	17.6	9,655	22.5	16,593	25.4	23,841	28.30

It is known that the rate of growth of population in the rural areas is higher than in the urban areas but to simplify calculations, one may assume the national rate of growth as that for the rural and urban populations. Table-1 then reveals that 2.05 million persons migrated during the first intercensal period 1951-61, 1.88 million during the second period 1961-72 and 2.43 million during 1972-81. Without going into details regarding the reliability of statistical data, it is possible to see that almost 200,000 persons have been on the move from rural to urban areas every year during the first two intercensal period. The rate seems to have increased during the last intercensal period to an average of 243 thousand each year or to 657 persons per day. This then is the fugacity of the persons living

in the rural areas of Pakistan. 0.4% rural population is thus on the move, from each village of approximately 1,250 population or each one of them is contributing an average of 5 to 6 persons to urban centres every year. This rate does not seem to be high,perhaps,because the whole population has been taken as the basis, which may not be correct since women, children below 10 years, and old persons usually remain behind. Thus,the ideal figure to be concerned with would be the labour force which, according to estimates of the Manpower Division, is 16.59 million in the rural areas. This puts the fugacity of the rural workers at 1.46% or 15 workers per thousand or 19 workers per village.

According to Prince Sadruddin Aga Khan, High Commissioner for Refugees, a figure of 2,000 refugees per day on a global scale is alarming. One can, therefore, imagine the crisis faced by Pakistan that the number of migrants from its rural areas is one-third of the world figure. This high rate only shows that Pakistani rural area workers are highly fugacious.

The fugacity is not limited to rural areas only. The urban population is also moving to the Middle East and western countries. Their number has been increasing every year as would be noted from Table-2 and it is estimated that at least 10% of the labour force is employed abroad.

It may be seen that the rate has gone up only during the last intercensal period with an average of 300 to 400 persons per day, which is only one-fifth of the world refugee figure. This is again a reflection on the highly fugaceous character of the Pakistanis.

It would be reasonable to make a distinction between the fugacity for the world refugees and that in the context of Pakistan. The former is because of unbearable environmental conditions, such as, warlike situations, which is analogous to heating a solution to boiling when a majority of the volatile component leaves the container. The latter is like rapid evaporation due to heating of the solution in the container and effectively speaks of the extreme paucity

of resources. When compared with the fugacity of water, i.e. the 35 million gallons contained in one cubic mile of the air above water constitutes only 0.004% or 4 parts per 100 thousand, it appears reasonable to assume that the

Table-2
Labour Force Emigration Data

Year	No. of Workers
1971	3,534
1972	4,350
1973	12,300
1974	16,328
1975	23,077
1976	41,690
1977	140,522
1978	130,525
1979	125,507
1980	129,847
1981	168,403
1982	142,954
1983	128,206
1984	100,407

fugaceous nature of human beings is comparable with fugacity of natural substances.

The migratory process among the persons from developed as well as developing countries has been in operation since a long time. Statistics on immigrants from Commonwealth countries to United Kingdom reveal that even in 1962 approximately 0.01% population of Pakistan was seeking migration to the latter country. Skilled workers and graduates constituted 3.4% of the total applicants intending to migrate and 10% of the total number of graduates and skilled workers produced that far. This is a brisk evaporation rate and speaks either of unsettled conditions in a country or of the fugaceous nature of the persons. It may be noted that conditions in India were equally bad if not worse but the number of applicants was only 20% higher

than from Pakistan with a population of 20% that of India. Since fugacity of the migrants does not seem to be proportional to their concentration, as demanded by the laws of ideal solutions, one could suggest that the fugaceous nature of the people of Pakistan was itself responsible for the nucleating migratory process.

Table-3 on page 45 reveals that the number of intending migrants is higher for developing countries e.g. Ceylon, Cyprus, India, Jamaica, Nigeria and Pakistan as compared with developed countries like Australia, Canada and New Zealand. The number of applicants from unskilled persons from the latter group of countries is much smaller in proportion to that from the former category. Illiteracy and unsettled conditions seem to be the major reason for the pattern obtained for developing countries where, in physico-chemical sense, the kinetic energy due to rise of heat content becomes high and so does the fugacity from their environment. The escaping tendency among the low level workers also seems to be so high that they would rather accept a menial job abroad than stagnate at home to acquire skill which might give him only marginal benefit.

It may also be noted from the Table that the absorption by way of admitting the applications is much higher for Australia, Canada and New Zealand than for the developing countries. This may be attributed to easy integration of the concerned population in contrast with those for whom there would be difficulties during the process of socialization. This is in conformity with the postulate that like socializes like.

In contrast with the difficulties faced by coloured migrants to UK, there was an expected affinity among Pakistanis and the society in United Arab Emirates, UAE, because both of them follow Islam accordidng to which all Muslims belong to the Ummah. Pakistanis desiring better living conditions started looking for opportunities towards the early seventies. While the UAE was looking for persons to help them in building their lands and in consolidating

Table-3

Number of Commonwealth Citizens Seeking Immigration into UK in 1963

Country	No of Applicants							
	Relation and Friends of countrymen already settled in UK		Skilled Workers and Graduates		Unskilled Workers and Ex-Service Personnel		Total	
	Applications Received	Admitted	Applications Received	Admitted	Applications Received	Admitted	Application Received	Admitted
Australia	402	371	1004	990	615	416	2021	1777
Canada	248	206	1129	1087	1017	607	2394	1900
Ceylong	98	78	413	417	1781	750	2310	1245
Cyprus	1515	953	15	15	391	204	1921	1172
India	2211	1397	4937	4572	147130	15196	154278	21167
Jamaica	524	327	99	91	5287	3138	5910	3556
New Zealand	137	128	292	283	175	109	604	520
Nigeria	177	136	1277	1217	7360	2784	8814	4137
Pakistan	4908	2386	4446	3959	120464	11222	129818	17567

their economy, economic conditions in Pakistan were getting worse because of loss of East Pakistan, devaluation of rupee, mechanisation of agriculture etc.

There are several contrasts which characterize the societies in UAE and Pakistan, and they do seem to be parallel to the disparities between the rural and urban living, the difference being that they are several times magnified and this is considered by a migrant as a risk well worth taking.

The UAE is thinly populated with a population of 1.5 million while Pakistan has over 90 million persons inhabiting its land. The per capita income of the former country is among the highest in the world being $ 34000 while Pakistan has the per capita characteristic of the least developed countries viz $ 350. On the other hand the infra-structure facilities for education, civil and defence services are well established, which are some of the main deficiencies of the UAE. Arab beduines leading a tribal life are a contrast to the Pakistani society comprising peasants, city dwellers and tribesmen. The former speak Arabic but the latter can only understand it; they prefer to speak their own language and move among their own social groups. The living conditions in the UAE are enviable; everything is well-organized, the streets and homes are neat and clean. Pakistani cities are filthy, there is environmental degradation all around; the cities have been ruralised and the villages are impoverished of the basic amenities mentioned earlier.

The disparity in employment of the Arab as against a Pakistani is manifold. An Arab fresh graduate can get a high executive job but a far better qualified Pakistani would only get a subordinate position. There is no question of owning property or independant business by foreigners in UAE but the Arabs do have property and business in Pakistan.

The major deficiency in the UAE society is the availability of manpower at all levels of life. Therefore the country has had to depend on expatriate labour. The oil crisis of

1973 followed by its high price increased the revenue of the UAE and attracted wave after wave of migrant workers. The Arabs were the first to migrate and they were followed by Pakistanis, Indians, Bangladeshis, South Koreans, Philippinos, Thais, Indonesians etc. The composition of the Migrant Labour Force in 1980 is listed in Table 4.

Table-4

Composition of Migrant Work Force in UAE (1980)

Country of Origin	In Saudi Arabia Millions	In UAE Millions
Pakistan	1.2	2.3
Egypt	0.8	1.15
India	--	0.8
North Yemen	0.35	0.33
Jordan	0.14	0.22
Philippines	0.25	0.34
South Korea	0.102	0.171

There were nationals of some 68 countries in 1980, working in Kuwait but those from South Asia formed a majority, suggesting, as did the figures for Commonwealth countries, the highly fugaceous nature of people of this region, particularly of the Pakistanis. The composition of the migrant workers may again be seen not to be proportional to the population of the country of their origin but is related more likely to the fugaceous nature of individuals which, as noted above, was quite high even as early as 1963. The fugacity, however, conforms to equation (1.3) and is determined by internal pressure of the society. The latter property varies directly with the degradation of the environment. The 68 countries from where UAE receives labour have severely impoverished resources which is a major reason for the degradation of the environment. They are the ones with a low quality of life index. Their environmental conditions are unbearable and hence fugacity of high as well as low level manpower is found related to equation (2.3).

Chapter III

ASSIMILATION

Asssimilation in sociology, is merger of diverse culture elements. The fugaceous persons belonging to different societies, have to lose their identity, in having left their land. Their first worry is to get condensed and thereafter try to integrate themselves into the local population. They try to settle down, build their own houses in their own traditional fashion. Some of the affluents among these refugees, become property dealers or own properties, become businessmen, transporters or else construction labourers to earn a living. The property relevant to the description of assimilation which,in effect,deals with merging one culture element into that of the majority, should be governed by the laws of solution mentioned earlier i.e. by partial vapour pressure of concerned component above the solution. The latter property governs the escaping tendency or fugacity of a given species from solution, assuming that the vapour would behave as an ideal gas.

In considering individual behaviour in a collective surrounding one would find the escaping tendency to be proportional to concentration. Or, as stated by Raoult's law the partial vapour pressure in an ideal solution is proportional to the mole fraction of the particular component in solution. The assumption of ideality is necessary because it implies that the cohesive forces among the species are uniform. The law has been found to be applicable to the solutions of relatively involatile solute and volatile solvents. According to this law escaping tendency of a component A from a solution of A in B, as determined by its partial vapour pressure is the same as that from pure A excepting that it is reduced proportionately due to its lower fraction in the solution. This may be expressed as

$$P_A = X_A P^\circ_A \quad \ldots\ldots\ldots\ldots\ldots\ldots (3.1)$$

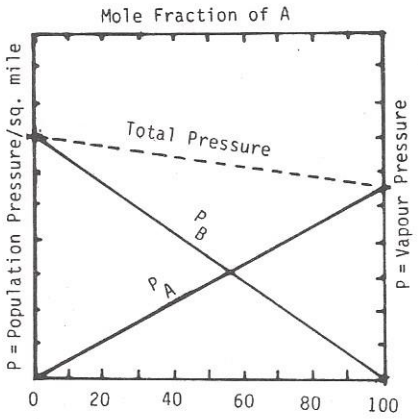


Fig. 3.1 Percentage Fraction of Group A

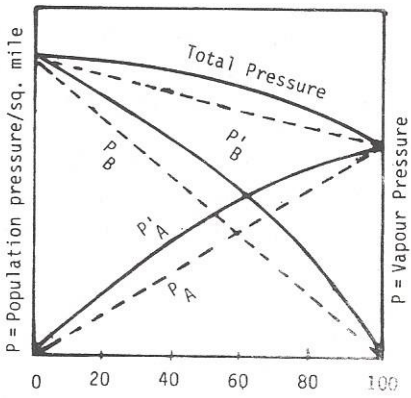


Fig. 3.2 Percentage Fraction of A Positive Deviation from Raoult's Law showing Repulsion, Immiscibility or Lack of Association

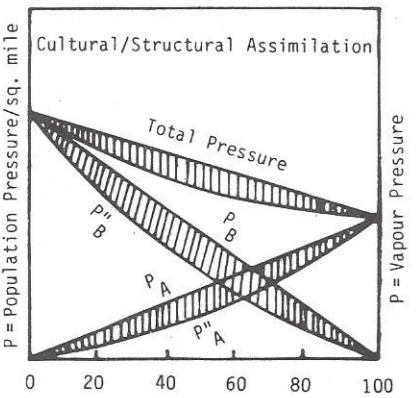


Fig. 3.3 Percentage Fraction of A Negative Deviation from Raoult's Law showing Attraction, Association or Assimilation

where P_A is the partial vapour pressure of A above a solution in which its mole fraction is X_A and P°_A is the vapour pressure of pure A at the same temperature. When a component B is added to pure A there is a relative lowering of vapour pressure given by equation (3.2) where X_B is the mole fraction of B.

$$\frac{P^\circ_A - P_A}{P^\circ_A} = (1-X_A) = X_B \quad \ldots\ldots\ldots\ldots (3.2)$$

A situation such as this is to be found in the case of migrants settling in the already settled large communities, such as the white immigrants from Europe who settled in USA in the nineteenth century. The above formula would be applicable to the fraction of population constituting the migrants whose number would be given by X_B. The partial vapour pressure with respect to the communities may be approximated by the population pressure or number of fugaceous persons trying to settle or condense.

The vapour pressure of the components in solution when plotted against their mole fraction gives a linear relationship for the total vapour pressure for an ideal solution. However, only in exceptional cases are solutions found to obey Raoult's law over an extensive range of composition. This is mainly because a complete similarity of interaction between components is rarely achieved. Consequently both positive and negative deviations from linearity such as that represented by the curves P'_A and P''_A in Fig. 3.2 and 3.3 are obtained

Fig. 3.1 can be used to calculate the composition of fugaceous persons in a community, supposing (1) that the fugacities of A and B are separately known and (2) that the fugacity of A is lower then that of B. In the USA of the nineteenth century, the society had attained a status whereby the escaping tendency had been reduced to a position lower than that in Europe and they were the As, the majority species of equation (3.2). Those coming from Europe in

the nineteenth century were traditionalists e.g. the Irish who had to leave because of famine in their country. The fugacity of both the communities was, therefore, low and hence can be represented by P' and P" of Fig. 3.2 and 3.3 where the two end points A and B are conditions representing their maximum fugacity corresponding to boiling points of liquids.

The composition of the society AB at point Y corresponding to a certain condition prevailing in the country would

$$2000 = P^{\circ}_A X_A + P^{\circ}_B (1-X_A) \quad \ldots\ldots\ldots\ldots\ldots\ldots (3.3)$$

be given by equation 3.3 where 2000 persons per day was the fugacity of the Europeans towards the end of the last century because over 20 million of them migrated during a period of 30 years. This number has also been quoted by the UN High Commissioner of Refugees as the international rate of migration of refugees as of the year 1981. If P°_A is 700 and P°_B is 2700 which may be the fugacity for A and B being local fugitives and refugees respectively, then equation 3.3 suggests that under the conditions given by

$$2000 = 700X_A + 2700(1-X_A)$$

$$= -2000X_A + 2700$$

$$\text{or} \quad X_A = \frac{7}{20} = 0.35 \text{ and } X_B = 0.65$$

$$X_A^{\text{fugitives}} = \frac{P_A}{2000} = \frac{X_A P^{\circ}_A}{2000} = \frac{0.35 \times 700}{2000} = 0.12$$

$$X_B^{\text{refugees}} = \frac{P_B}{2000} = \frac{X_B P^{\circ}_B}{2000} = \frac{0.65 \times 2700}{2000} = 0.88$$

Y, those who would be seeking condensation or would be trying to settle down would comprise 88% refugees and 12% local fugitives. This was also the situation at Peshawar in 1981 when as many as 2700 Afghan refugees were crossing over into Pakistan while 700 Pakistanis were themselves migrating from rural to urban areas. The city of Peshawar

was faced with an explosive situation since the refugees were dominating over the locals everywhere at least on the outskirts. The Afghan refugees were finally allowed to settle into large refugee camps holding several thousand persons at each location on the outskirts.

Henry's is another law which is generally applicable to dilute solutions and particularly to those of volatile solutes and relatively involatile solvents. In very dilute solutions the condition of ideality or uniformity of forces among solute A and solvent B is achieved since in such cases the molecules of the solute are completely surrounded by those of the solvent and this offers a uniform environment for the solute. Under such conditions the escaping tendency of A from the system is proportional to its mole fraction and is given by:

$$P_A = KX_B$$

where K is a constant which is different for different substances. The law is nearly but not exactly obeyed and that also is for a relatively low range of composition.

An example of this situation for the societies is provided by the first wave of migration of the Europeans to USA after the Civil War. They had relatively fewer problems in getting assimilated compared with those migrating later on. The escaping tendency of individuals from the main society at that time was approximately the same as given by the above formula since it would be proportional to the number of immigrants, X_B.

Henry's law, like Raoult's law is not obeyed over a complete range of concentration and there are positive or negative deviations from ideality. In both cases positive deviations are noted when the vapour pressures are higher than those calculated. Accordingly the escaping tendencies of the components are higher than those of individual pure liquids. This is possible if the repulsive forces between different species in solution dominate over the attractive

forces. The result is that miscibility is retarded. Such a system is that of non-sociable species which would be happier by themselves. Mixing such components generates an increase in volume and absorption of heat. Such deviations are represented by curves P''_A or P''_B in Fig. 3.2. Contrarily negative deviations are a result of attractive forces between unlike molecules in solution. In such a case the vapour pressure of the solution is lower than the sum of pure liquids. The escaping tendency of components in solution of this nature would consequently be lower than in pure liquids since association or even compound formation is obtained and mixing the components results in contraction of volume and evolution of heat. These negative deviations are noted by curves P''_A or P''_B in Fig. 3.3.

It may be inferred from the above discussion that positive and negative deviations from Raoult's and Henry's laws are noted depending on whether the intermolecular forces are attractive or repulsive.

Deviations from Ideality

Very few societies would generally prove to be ideal. One of the pre-requisites for ideality is equality of interactions and this demands: (1) that the dislikes are minimum, (2) that there is no heat of solution, and (3) that there is no change in volume. In the case of society these imply that dislikes which are a source of adverse reaction should not be present during the process of socialization otherwise they would lead to rise of sentiments. Equivalent interactions are possible only if they do not involve untoward reactions. In case of inequivalence among components generation of local heat is usually encountered. Volume change is usually not observed when two components are mixed but this is not necessarily true and changes are reported for certain interactions, which are not in accord with the laws for ideal solutions. For the society this would mean that during the socialization process no distinction or problem towards interaction would be created. An ideal solution is obtained, however, when it is sufficiently diluted and

analogously for a heterogeneous society ideal conditions could be obtained if one component is much smaller than the other.

There may, in general, be two types of deviations from ideality: positive and negative. Positive deviations are obtained in solutions having higher vapour pressures and negative deviations in the ones having lower vapour pressures than those calculated for ideal solutions. For positive deviations, the escaping tendency of the components in solution are higher than in the individual pure liquids. This is due to lower cohesive forces between unlike molecules than in like molecules such as in pure liquids. The attractive forces between A and B are less than those between A and A, and B and B which leads to separation of the liquids and they are almost immiscible.

Immiscibility is a common phenomenon in case of the society having significant dislikes among the components which then become rather unsociable and try to segregate themselves from the others. This was the case with the Bengalis and continues to be the same among the different components of the society in Pakistan. The Bengalis, whenever, they saw another in a group of visitors or in a group meeting, would tend to socialize with him rather than the rest. Their fugacity had no relation with the group to which they belonged and was largely related to their own component (Bengali).

The same is also the case with ethnic groups in different parts of the world. Whenever these ethnic groups meet, they are sure to be more sociable among themselves. They cluster together and even tend to be immiscible with others. Segregation of this kind is a common phenomenon in a society like that obtaining in Canada where there are mixed races. They all have a tendency to move and live together. The Arabs, Jews, and Negroes tend to socialize among themselves and are clear examples of positive deviations from ideality.

The thermodynamic conditions required for ideality

are not met in case of positive deviation from ideality since there is an absorption of heat and an increase in volume on mixing the components. This is also reflected in the mixing of componants of the society. In order to bring about socialization some energy will have to be inducted into the system and for a society this could be either political, moral or religious. The Bengalis joined hands with West Pakistan since the cohesive forces were better strengthened against the Hindus and the British, socialization with whom was creating high heat. When the negative forces of the last two components were withdrawn, the former themselves developed temperature or agitative symptoms. This process reduced the cohesive forces holding East and West Pakistan and when the negative forces became dominant the result was immiscibility and separation.

The volume change or a revelation of distinction between species or problems arising during interaction become apparent when unlike components are mixed. Accordingly the Shudars or untouchables could not come near a Brahmin. Even their shadows falling upon the latter would create untold problems. These are the positive deviations from ideality and are the reverse of the socialization process described above.

In the case of negative deviation from ideality the attractive forces among the different components in solution are greater than among the molecules of the same components i.e. the attraction between A and B is much greater than between A and A, and B and B. The escaping tendency of a component from the solution is therefore lower than in the pure components. Here the thermodynamic conditions are such that there is a contraction in volume and evolution of heat on mixing.

In the socialization process, the components of the society are so integrated by the majority that their escaping tendency is reduced to an extent lower than that of the individual components. This may be explained by the case of an intermarriage between a boy and a girl belonging to

two ethnic groups. The heat generated on this admixture has, in many cases, resulted in the breakout of riots between communities but once they are accepted by the society (or they go in solution) they become part of it. The escaping tendency of either the male or the female is much lower than what it was when they were in their own communities. As time passes by there is no revelation of distinction; rather it is discouraged by the society to reveal their identities or there is a negative attitude towards distinction.

In a strongly associated solvent like water, the addition of a second component usually causes positive deviations from ideality. This is because the addition of the second component causes deploymerization of water leading to increased partial vapour pressure.

funny

In a homogeneous and cohesive society, e.g. in Japan, the settling of an American would split or depolymerise the community there and the fugacity of the American would be much greater than that in America. The fugacity of the Japanese would similarly be enhanced by the presence of the Americans. The Americans, consequently, did not settle in Japan but there was an increase in migration of the Japanese to the United States because of the living conditions in their own country.

Solution Process

Solutions may be either heterogeneous or homogeneous in nature. The heterogeneous solutions may be considered better as a mixture of components where each one of them maintains its individual property. In the homogeneous solution the properties of the original components are not maintained. The melting point of the solution is lowered, the boiling point is raised and so are the physical properties changed; in short, new properties appear for the solution. A salt solution, for example, has neither the characteristic property of water nor that of the salt molecules. There is an interaction of salt molecules with those of water so that there is depolymerization of the molecular framework of

the latter and this is the basis of the changes in the properties of the two components in solution. It will be realized that the number of interacting particles would determine the change in the properties and hence the concentration of the species is important. Salt solutions higher in concentration of the salt are highly saline while the one with an infinitely low concentration resembles water in its taste and properties.

The components of a society may form a homogeneous group by interacting with one another while a lack of uniform interaction may not have far reaching effects. They may not have common objectives, or have common goals and may also not be of help to one another in case of needs and emergency. Differences among the components when removed would give rise to a homogeneous society, otherwise the heterogeneous society, as the one in India consisting of caste systems and a vast number of communities, may create problems. The presence of the Muslims in India presents one such example. On the whole the Muslims are about 10% of the total population of that country. There has been an increase in violent interactions among the two groups because of the differences in their religion. The minority does not want to lose its identity and the majority does want to assert its superiority and domination. However, where the Muslims are in negligible minority, resembling a dilute solution, the negative interaction is the least and hence there is no major conflict among the two components. With an increase in the population of Muslims making them a significant minority riots are always noted.

At this stage of drawing analogies it might be worth considering the solution process and comparing it with the formation of the society. When some granules of salt are placed in a vessel containing water, the granules disappear. The framework, called the lattice in which the salt ions are placed, is broken apart and the individual molecules are dispersed throughout the solution. It so happens that the salt molecules on the outer edges or the surface,

directly in touch with water, are pulled out by the dissolving forces of water. These dissolving forces must be attractive forces between salt and water which may be larger than the attracting forces between the molecules of the salt and salt i.e. among themselves. As the threshold molecules are dissolved the next in line and the one thereafter have to face the pull and thus all the particles are dissolved. On the whole, the attractive forces between the salt molecules must be lowered and so should be the attraction between the water molecules and both of them must be lower than the attraction energy for the solvation of the molecules i.e. salt-water attraction should overcome the salt-salt attraction and water-water attraction.

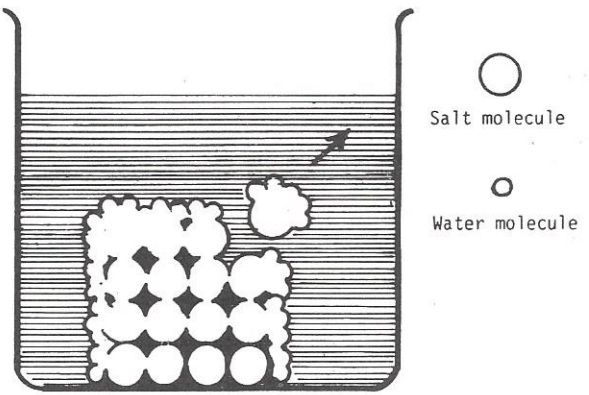


Fig. 3.4 Molecular picture of the solution process

Consider a clan which happens to settle in a large community, for example,the refugees from East Punjab who migrated to West Punjab. When they came, they were prepared to settle down and lead a life in freedom along with the others living there already. The interaction started when for one reason or the other, may be for the fulfilment of one of their needs, one of the persons in the group had to go to a member of the larger community for help. This particular individual may be considered as the molecule

on the surface of the salt mentioned above. He would be a stranger needing help and every person in the vicinity would be prepared to extend a helping hand. This individual, in turn, would be attracted by the majority community. When and if the majority members respond to his needs, the rest of the settling members would seek increasing interaction and in case of a favourable response they would be prepared for the pull by the majority. The interaction having once started would continue as a free exchange and thus the migrants may get assimilated into the larger community. If there are not many differences with regard to their culture, tradition, language and the daily routines among the members who migrated and the ones who were already there, as in the case of the refugees from East Punjab, the assimilation would yield a homogeneous society.

It would be of interest to study the quantitative aspect of the process of solution. Each solvent or medium has a certain capacity to dissolve another substance, called a solute. A saturated solution in a particular solvent is obtained when a solute has been dissolved to the maximum capacity. Exceeding the limit of saturation gives a super-saturated solution and for cases below this capacity they are unsaturated. The properties of solution at each stage of concentration are different. The super-saturated solution can easily give rise to a crystallized product on storage. The saturated solution may also yield a crystallized form of the solute and here the crystallization is more uniform. In a supersaturated solution the properties of the solute are more apparent than in the dilute or unsaturated ones.

In the case of society also there is a limit to the assimilation by a large community. Individuals of a different community can easily be accommodated by a large community but only to a limited extent. For example, there was a limit to the absorption of refugees from India coming to Sind. After having exceeded this limit the local populace started reacting and conflicts were observed as early as 1948. In the Karachi area these limits were exceeded to the extent that the locals were out-numbered and the situa-

tion in the city was similar with respect to the refugees to what it was in Peshawar in 1981 when according to the calculations presented earlier, the Afghan refugees were dominating over the locals. The data were also similar, only the local fugitives need be replaced by Hindu migrants to India in equation (3.3). In the rural areas of Sind province, however, this limit could not be reached. The absorption and assimilation by the locals was quite healthy and there was no conflict. In the Karachi area, therefore, it was a supersaturated society of the refugees while in the rural areas it was unsaturated. Hyderabad also presents a supersaturated society but in Sukkur, this is not the case. There has been assimilation by the Sindhis to a large extent and the refugees have been accepted wholeheartedly, so much so that no conflict among the communities has been reported there so far.

In this solution process an equilibrium is maintained between the solute and solution. This equilibrium is attained when the concentration has reached the point of saturation. If the solution is not saturated, the solute would disappear until saturation is reached or equilibrium is established. At the point of saturation, the excess solute remains unchanged and so does the concentration of the solution. This presents a state of dynamic equilibrium. This is dynamic equilibrium because when an irregularly shaped crystal of the solute is dropped into the solution it changes its shape, although it may maintain a constant weight. In the equilibrium state the dissolving of solute is still in progress but it is compensated by the precipitating out of the solute. It would appear on close observation that the number of solute particles dissolving per unit time is the same as the number of particles leaving the solution and the amount of excess solute remains the same.

The formation of society occurs in an analogous manner. The absorption of the migrant from Europe to America may be cited as an example. The number of people being admitted to this continent is limited so as to maintain an equilibrium between the various cultural groups already

present there. If this limit is exceeded there is a possibility of an overgrowth or supersaturation and there might be conflicts. The minority in the United States presents itself as another problem where the dynamic equilibrium has been disturbed. There has been an overgrowth of the Negro population in some cities. If the equilibrium had been maintained through dispersion in the early stage of inception, there was every likelihood of minimising the chances of clash.

The solubility of a substance depends on a number of factors, some of them being the nature of the solvent, nature of the solute, temperature and pressure. To illustrate the point of assimilation it would be better to be concerned here only with the nature of solvent and solute and to consider the effect of temperature and pressure on socialization in a subsequent chapter.

The set of conditions required for the interaction and consequently solution are also operative in the determination of solubility. The interactions as mentioned earlier concern the solute-solute, solvent-solvent and solute-solvent and if the solvent is changed it would only mean change in the last two interactions. Solvents differ from one another in many respects and hence these two interactions are the only variables for the solution process. It is generally true that "like dissolves like". Under these conditions then, a similarity in the properties of the solute and the solvent would mean solute-solvent attractions. If this attraction is high there would be a high solubility and if it is weak, it would be low. Thus salts would dissolve in water but not in gasoline; salts are polar substances and so is water unlike gasoline which is non-polar.

The nature of the larger community interacting with a smaller community also has its likes and dislikes. It would assimilate only such persons or individuals and hence a community, which conforms to their life style. A highly polar solution is like a highly permissive society which does not have rigid norms and hence its individuals let

any community do whatever it would like to, so long as it does not affect them directly. An ideal society like that of the true Muslims is expected to accept any community without making any distinctions regardilng caste or creed. When the Sindhis accommodated the refugees, from India or Pakistan accepted the Afghan refugees, they did so because they developed some polarity. They were possessed by religious feelings for their brethren migrating from across the border. The African society, however, presents itself as a non-polar society. It is not prepared to accept others in the community. Africans do not easily assimilate the migrants. There are many dislikes rather than likes between the two and hence immediately after a certain concentration of the migrants is reached, interactions leading to explosive violence takes place and the dynamic equilibrium is reversed.

A case in point is presented by the 2.9 million coloureds who constitute a significant minority in South Africa. They are a mixed race having their origin from the first Dutch settlements in 1658. They are owned neither by the whites nor the blacks although they are close to the former by heredity and to the latter because the country is their motherland. Assimilation of the coloureds in South Africa is therefore a problem not only for the whites but also the blacks. Instances of rejection by whites is a daily affair. Thousands of coloured families in Johannesburg are facing prosecution for having moved into a 'white' area designated so by their Group Areas Act. The white husband of a newly-wed coloured woman was forced to quit the man's residence in a white locality and had to relinquish his white status to be reclassed as coloured. These are obvious examples of retarding miscibility.

In the USA the blacks are rejected by the people but in South Africa they are done so by the Government. Although inter-marriage among the two races has produced a population of the 2.9 million coloureds, yet this mode of assimilation has not been accepted. This could, as done earlier and also in a later chapter, be explained by consi-

dering the whites as the polar and the blacks as non-polar societies. The coloureds are slightly polar and that is why they consider themselves close to the whites. They apply their own race discriminatory methods at various social levels depending on the darkness of the skin. The inter-marriage introduces polarity but in this case the same is not sufficient to impart solubility or assimilation. The situation seems to be similar to the miscibility of the highly polar compounds viz. alcohol and water. However, in spite of the presence of the same group the polarity of butanol is not sufficiently high and it is only partially soluble in water.

It is at this point that the assimilation process as observed in America should be appropriately discussed. Assimilation of white immigrants who migrated before the Civil war can, as said earlier, be described by Henry's law. At the onset of the immigration process, the German and Irish immigrants settled in the Northern industrial cities. At that time employment was available almost anywhere in the city areas. Furthermore, abandoned houses were available in many sections of the cities. They settled in minorities and could not get concentrated. A thin settlement such as this has also been described for the formation of dilute solution where the solute molecules (immigrant) are completely surrounded by solvent molecules (local majority). Assimilation in such a case was not difficult, the immigrants easily lost their identity, and even modified their surnames.

White immigrants coming towards the turn of the last century came in increasing number at a time when employment opportunities were available only in central locations. This made it possible for groups to settle in locations close to the place of employment which was to be found in the fringe of central districts. According to the accepted notion of assimilation of white immigrants as described by Hershberg and others, immigrants settled in densely populated ghettos among friends and neighbours of same ethnic background. They had to settle into enclaves because of

the hostility of the natives and according to these authors, "a piece of Europe was transplanted into the streets of America." Ethnic groups thus separated out. USA absorbed 20 million immigrants in 30 years towards the end of the last century.

This separation out is similar to the case of positive deviations as noted above in the discussion of Raoult's law. When these deviations are sufficiently large, the components do not form a homogeneous solution any longer. With successive addition of any component, which in the present case is the white immigrants migrating before the Civil war, a limiting solubility is reached. Beyond this point two distinct phases are invariably obtained. For immiscible components, thermal energy has to be put in to promote miscibility. This energy input conquers the reluctance of components to mix freely. In the case of white immigrants it was the hatred of the natives which created immiscibility of the components. Violent reactions were noted if the immigrants tried to get into the main society. Miscibility could, however, be achieved under legal cover, which sufficed to conquer the reluctance of the local majority towards accepting the immigrants. However, when the legal cover or police protection was withdrawn, immiscibility was again visible.

The analogy with solutions is again borne out since those which display large positive deviations from ideality at elevated temperatures, frequently split into distinct phases when cooled. The white immigrants who settled in the late nineteenth and early twentieth century knew what ghetto life meant. It was nothing but segregation and separation from the main society and a consequent frustration. They, however, suffered this agony somewhat temporarily because with expansion in the northern cities, population absorption was again possible and those who had developed the capacity to interact favourably with the main society or those who had developed the polarity to become likeable got absorbed or assimilated. It may be recalled that like dissolves like i.e. only like natured substances would form

a solution and as such a certain polarity is desired for a solute if the solvent is already polar. The American society, as observed, only absorbs those who are polarizable and hence the white immigrants who had developed the fugacity to get out of the enclaves, and had also developed a polarizability, got assimilated. The process of assimilation has, however, been going on through continuous interactions of the components and with the passage of generations, i.e. the second and third generation immigrants of European origin have lost their identity including a modefication of their surnames, as stated earlier.

The process of interaction of the blacks is not like the assimilation process of the whites in America. In the case of the blacks the main society was much more hostile and since they were obviously not like the latter, a homogeneous solution has never been obtained. If a solution is not obtained, the two immiscible phases are distinctly separated, which is the case with the settlement of the blacks. Opportunities similar to those offered to the whites did exist in the past. There also was heavy demand of labour due to a consequent demand for industrial production. Job opportunities so created, attracted the blacks and the Great Migration set in towards the north but the most they were offered was work as unskilled labour. There have been four successive waves of migration: during the twenties, World War II, fifties and sixties. The assimilation process, however, never set in for the blacks.

The blacks are after all Americans and they also have the American dream in mind. They therefore migrated to cities anywhere in USA. In the 1900, 90% of them lived in the south but in 1970 only half of them had remained there. By this time i.e. 1970, 81% lived in urban areas and were more urbanized than the whites. Among the largest metropolitan areas, 16% of the total population is black but in the central districts of these areas 31% are black and only 5% of them are in the suburbs. Their population has grown from 8.8 million in 1900 to 20.5 million in 1970 and some cities like Washington, Atlanta, Newark and Gary

have more blacks than whites.

The above description shows that the process of growth of the blacks has been independent of the whites. In other words the two components have remained immiscible all the time. There has been very little interaction, if at all, among the components to obtain a negative deviation in the sense of Raoult's law which results when there is compound formation. The interactions have on the contrary been violent, which has promoted their reluctance to mix freely. This may largely be due to the unlike nature of the solute and solvent, the former, as said earlier about the Africans are neutral and the latter i.e. the host society are highly polar.

The assimilation of the white immigrants has been possible with passage of time becasue they became skilled labour. The blacks on the contrary have been out of the main society or solution and have been restricted to odd jobs. They have, thus, been denied vertical mobility in spite of their growing in age. For them there is discrimination in job opportunity, housing facility, educating children, obtaining transportation etc. which are some of the basic facilities deterministic of assimilation.

Gordon considers two types of assimilation: cultural and structural. Cultural assimilation refers to the participation of the ethnic group in the basic institutional arrangements of the society. This is possible when the group (solute) is induced (polarized) to accept some basic behaviours of the host society. Structural assimilation, on the other hand, demands the involvement of ethnic group members to develop primary relationship with the host society e.g. through club membership, participation in social activities etc. According to Gordon this is a necessary and sufficient condition for the eventual elimination of the racial or ethnic status, which is responsible for the differences. The two components start coming together and gradually the discriminatory behaviour of the host society is reduced and the barrier due to ethnicity of the minority group is

removed. In terms of the behaviour of components in a solution when the cohesive forces between unlike molecules increase there is negative deviation in terms of Raoult's law; there is association and this leads to miscibility. The case of participation in social activities or entry into clubs is like losing cohesiveness or affinity with the ethnic group (A) and forming a new relationship with the host society (B). When the cohesive force of A with the ethnic group of A's is weakened the member of the minority group accepts the social values and norms of B or the B's and having lost the ethnic barrier, A is first associated and finally assimilated. The previous repulsive forces between A and B become weak and so also do the cohesive forces between A and A. The overall situation at the stage of cultural assimilation is that the cohesive forces between A and A are weak, B and B is also weak and A and B is strong. This certainly is a nonideal situation and hence there is partial miscibility at this stage of assimilation. The concerned member of the ethnic group, as stated in Chapter II, has lower escaping tendency when he is in the surrounding of the host society.

Socio-economic assimilation should be considered as an intermediate process in the overall absorption mechanism, while cultural assimilation implies acceptance of the norms of the local majority. The latter may not require full participation in a public education system or in the occupational structure. Consequently there is marked difference in income distribution of the ethnic group. This results in only partial miscibility and it is a common sight in any multi-racial society that business is owned and operated by the minority. Socioeconomic assimilation should precede structural assimilation. In order to obtain assimilation the miscibility process must be effective and this is possible either by pressure, thermal agitation or through the induction of polarity. The first two can be effected through legal procedures but the third is created by inducing the majority to accept the minority as its equal partner and not as an inferior.

Whites do not like to live in the same neighbourhood as the blacks even if the latter are of the same economic standing. The main reason is that the blacks are considered lower in status. Creation of a polar group can induce acceptance by the majority, since it is a polar society. For instance, polarity is being created among the blacks who having felt rejected, have started embracing Islam, the religion which does not allow discrimination between blacks and whites or among themselves. They are being placed at a slightly better position in the world community if not in their own country. They are also provided a better position by the non-white immigrants in America than offered by the whites. The induction of polarity in the form of accepting and practising a religion whether Islam or Christianity or by becoming a musician or sportsman has introduced partial miscibility, but not the assimilation of the blacks.

Assimilation of the Indian Muslims also presents a peculiar sociological problem. The Indian Muslims were once upon a time the rulers of the country. The Turks and Moguls ruled the country through a strong interaction with the Hindu Rajputs but the Hindus were never able to accept Muslims as their superiors, nonetheless the Muslims do consider themselves a separate if not a superior entity. The laws of socialization stated and discussed in the earlier pages, accordingly suggest that the process of miscibility has not been possible as regards the Muslims. By helping create Bangladesh, India has succeeded in dispersing the Indian Muslims into three countries viz India, Pakistan and Bangladesh but she has not been successful in getting their identity lost. The Hindus wish that while remaining Muslim by religion they must be Indians following Hindu culture just like the Thai and Chinese Muslims, both of whom have not lost their identity. The identity of Muslims finds its roots in religion and culture and the odd relation it has with the Indian Government. During the 38 years after partition there is still a deep sense of insecurity among all the fields, be they physical, economic or cultural.

The acts of injustice, under-representation, physical violence, economic discrimination or cultural subversion are considered a step deepening the crisis of identity.

All acts to pressurize annihilation are carried out deliberately so that the Muslims are either eliminated or are contained into the slums and ghettos. Communal violence therefore takes place where the Muslims are a significant minority ranging from 20 to 45%, in Gujrat, particularly in Ahmedabad, in Delhi, Muradabad but not in Andhra Pradesh where the Muslims are less than 10% nor in Kerala where they are more than 70%. The communal riots during the recent past are so violent and continuous that they have permanently ruined and socially alienated the Muslims. This is actually the condition where immiscibility becomes favourable as per the principles of socialization.

The process of immiscibility is also promoted by the Government which neither protects the Muslims nor provides them any hope of better treatment by way of job, bank credit or other welfare services, not to mention a share in power proportionate to their population. Under-representation in services or parliament speaks volumes suggesting Government efforts to promote the process and if possible fugacity, since when scared Muslims would leave their homes and the Hindus would get the economic advantages and supremacy they have been looking for years. Since unlikes do not dissolve likes, it has not been possible for the Muslims to be assimilated by a Hindu society in India. Similar forces are also operative in other countries where the majority society has not assimilated another unless some of the major differences have been removed by the minority in an effort to become miscible and to get integrated with it. The Tamils in Sri Lanka, the South Asians in UK, the Palestinians in Israel are some examples of the unlikes faced with the process of immiscibility and segregation.

Chapter IV

HUMAN INTERACTION AND THE SOCIALIZATION PROCESS

A direct consequence of Man's nature of being a social animal is that he has to associate himself with people of his liking while continuing to remain in his society. He may associate himself with one or two or a number of persons. In the earlier pages the individual was designated as the smallest component of the society, which, in turn, was considered as a solution. The small components whether belonging to the society or the solution, associate with one another to form a cluster or group. Association results in alteration of properties of the solvent as well as solute or the assimilated group and the major component of the society. The following pages examine the interaction among species and the consequent proportional change in properties.

The association with one may be considered similar to formation of a dimer, with two as a trimer and with a large many as a polymer. The species forming dimer, trimer or polymer would co-exist with one another in the framework of the solution or society. Their co-existence would depend on a series of complicated equilibria determined by a number of factors chiefly involving inter-molecular forces or human behaviour under different sets of conditions.

Man socializes because he has to interact with his fellowmen and has to avoid isolation. Such constraints make individual living rare. The process of socialization may involve superficial contacts with a number of persons who form the majority society and a simultaneous intimacy with at least a few who are close friends or the dimers and trimers etc. One fights for attention of those who matter e.g. children with whom the parents are the closest since

their infancy. If the former feel getting neglected, they try to acquire a dominant position so that they can steal their attention. Similarly they develop certain habits if attention is denied to them. A society is thus composed of individuals who interact and socialize under conditions of the above type. These interactions are similar to intermolecular forces, which bring about clustering of molecules. Analogous to changes in the properties of the individual molecules on forming clusters, individuals change their behaviour on socialization.

By his very nature man is guided by positive and negative forces, which constitute the desires and fears respectively. Desires motivate a person to achieve the objectives while fears may repell him from his attainments. A mix of these forces is the essence of life processes and it determines whether the individual should continue to live in the society or should evaporate off. The last process viz. evaporation from a certain system such as a solution is governed by physico-chemical laws and it depends on cohesive forces among the components. An interacting mix of these forces changes the property or behaviour of the individual, which results in a shift in the equilibrium processes involving attraction and repulsion. One is able to express himself and draw the attention of the concerned ones and while doing so he may be scared of pain and have little tolerance for tension. Such a person may like to discharge the tension as soon as he becomes aware of it. Others may enjoy the delight of anticipating the forthcoming event of gratification and may stay on in the situation.

Tensions and frustrations are the inevitable constituents of the socialization process and they have to be tolerated to face the realities of life. Experiences of childhood affect adolescent and adult behaviour and they perpetuate fears and anxieties which are far from the present reality.

Children brought up in a large family, for example, have to face a number of situations in order to draw the attention of their parents who, in turn, have each of them

to attend to. The former have to resort to various techniques to take advantage of the little time which they might get with their busy father. One of them may speak very loudly, the other may speak rapidly while the third may, because of his inability to resort to either of these techniques, feel frustrated and start crying and, thus, urgently draw the attention of his mother if not the father. Children growing up in such competing situations may lose contact with other persons because of retardation of their capacity of self-expression. They may not be able to have close friends denoted by AB formed according to reaction (4.1) and may have only a superficial contact. Here A is a

$$A + B \rightleftharpoons AB \quad \ldots\ldots\ldots (4.1)$$

grown up member of the above family while B is some one he is trying to be friendly with. The habit of speaking rapidly or loudly which became the dominant part of A's nature may not be liked by B. In such situations the equilibrium is always reversed without any interaction and AB dissociates into A and B indicating that there is no friendship. Forward reaction to form AB i.e. a close friendship is possible if A is prepared to face the present reality and does not treat B in the manner he was being treated during his childhood. The change would come if he starts listening instead of speaking to B.

Individuals having different experiences of the past develop their own likes and dislikes and when allowed to interact in a group situation, they sense the behaviour of one another. They rank one member with respect to the other in their own perspective.

CURIOUS * The process of socialization, thus, comprises a series of complicated equilibria involving past experiences and present realities. Analysis of a system such as this requires the determination of equilibrium constants, which may be as many as the reaction processes. Considering the interaction of species from among groups A, B and C, an individual from group A may on getting introduced to another

from group B, continue interacting with him if the latter is responsive in the sense that he speaks as well as listens and follows the same norms as his own. A third person belonging to group C may neither be receptive nor repulsive to A, their interaction may not last much longer. A and C would not become close friends and may at best remain acquaintances. Individuals B and C may on the other hand be quite receptive. The following processes are,thus,taking place in the group:

$$A+B \underset{}{\overset{K_1}{\rightleftharpoons}} AB \quad \ldots\ldots(1) \quad \text{or} \quad mA + nB \overset{K_1}{\rightleftharpoons} xAB \quad \ldots\ldots(1)$$

$$A+C \overset{K_2}{\rightleftharpoons} AC \quad \ldots\ldots(2) \quad \text{or} \quad oA + pC \overset{K_2}{\rightleftharpoons} yAC \quad \ldots\ldots(2)$$

$$B+C \overset{K_3}{\rightleftharpoons} BC \quad \ldots\ldots(3) \quad \text{or} \quad qB + rC \overset{K_3}{\rightleftharpoons} zBC \quad \ldots\ldots(3)$$

As the interaction proceeds further, a linkage is established among the first set of persons and this could be described by formation of AB. The equilibrium constant K_1 describes the process of shedding of inhibitions by A and B and exploring common grounds for increasing positive interactions. The equilibrium process suggests that A and B interact to establish the A-B linkage but the reverse process of remaining as individuals like A and B is also operative. It may be mentioned here that it is customary to place the reactants on the left and the products on the right of the arrows. In deriving the equilibrium constant K, it is usual to have the concentration of the products in the numerator and of the reactants in the denominator. Values of equilibrium constants are useful in predicting the success of the reaction; if they are large it would take place, but if small it may be insignificant. In the above equations (x) is larger than y which is itself larger than z; o and m are much larger than p and r which,in turn,are larger than q and p respectively. The equilibrium constant of process (1) is given by

$$K_1 = \frac{(AB)^x}{(A)^m (B)^n} = \frac{x}{m\ n}$$

In process (2) the assumed interaction of A with C is not as good as in (1) and a weak linkage between these two species is formed. K_2 would then be smaller than K_1 but the chances are that K_4 the equilibrium constant representing the interaction of AB with A and C, and

$$K_2 = \frac{(AC)^y}{(A)^o (C)^p} = \frac{y}{op} \quad \text{and} \quad K_4 = \frac{K_1}{K_2} = \frac{(AB)^x}{(AC)^y} \cdot \frac{(A)^o (C)^p}{(A)^m (B)^n}$$

$$= \frac{(AB)^x (C)^p (A)^o}{(AC)^y (B)^n (A)^m} = \frac{xop}{ymn}$$

of AC with A and B would be much larger than K_2. There is an accompanying interaction between B and C as in process (3) which may be positive as in the case of A and B. The equilibrium constant K_3 may be of the same

$$K_3 = \frac{(AC)^y}{(B)^q (C)^r} = \frac{z}{qr} \quad \text{and} \quad K_5 = \frac{K_2}{K_3} = \frac{(AC)^y}{(BC)^z} \cdot \frac{(B)^q (C)^r}{(A)^o (C)^p}$$

$$= \frac{(AC)^y (B)^q (C)^r}{(BC)^z (A)^o (C)^p} = \frac{yqr}{zop}$$

order as K_1, but K_5 which is the equilibrium constant representing interaction of AC with B and C and of BC with A and C would be much smaller than K_4 since yqr/zop is much smaller than xop/ymn.

In the fourth process which takes place among As, Bs and Cs the formation of a trio or a trimer are indicated

as in (4) and the equilibrium constant K_6 is given by (4a). The value of K_6 is likely to be smaller than K_5 because in the first instance AC is not a favoured specie and secondly only few individuals from among A and B would be available to form the trio.

$$A+B+C \underset{}{\overset{K_6}{\rightleftharpoons}} ABC \qquad \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

$$\text{and} \cdot \; K_6 = \frac{(ABC)}{(A)(B)(C)} \qquad \ldots\ldots\ldots\ldots\ldots (4a)$$

It would appear that in the same group there is a simultaneous formation of dimers like AB, BC and AC and trimer ABC. The overall interaction may be described by (5), which represents the group situation and is similar to the physico-chemical processes taking place in a solution.

$$3A+3B+3C \underset{}{\overset{K_7}{\rightleftharpoons}} AB+AC+BC+ABC \qquad \ldots\ldots\ldots\ldots\ldots (5)$$

K_7, the equilibrium constant of the process is given by

$$K_7 = \frac{(AB)+(AC)+(BC)+(ABC)}{(A)^3(B)^3(C)^3} = K_1+K_2+K_4+K_6$$

The number of individuals of each group would determine the overall equilibrium process given by (5) in a small section of a society. For example, the more the As and Bs interact with one another compared with Cs the more would be the number of ABs followed by BCs and lower will be the number of ACs and much lower ABCs.

Supposing A represents a city dweller, B an agriculturist and C a tribesman, the equations suggest that the interactions in the ABC society would have more brotherhood among the city dwellers and agriculturists than among the former and tribesmen because of the ranking each group has for the other. The equilibrium process (1) suggests that the number of friends among city dwellers and agriculturists would be higher because of their number and would be given by K_1. City dwellers and tribesmen have little

common grounds, if at all and being clannish they would rather form C_1, C_2 etc. than AC which if formed would be like acquaintances suggesting weak linkages.

The association of AB, BC and AC with other members of the ABC society would further promote linkages and this would again depend on the experience of the associates. The equilibria would be firmly established if the interaction is positive and would be reversed if it is negative and if common grounds are not explored further.

The ratio of concentration of the several forms of association like AB, BC, AC and ABC remains in a certain fixed proportion and would appear as one interaction as suggested by equation (5) and depicted by K_7. The proportion could be constant if one was dealing with an ideal society. The norms of a society, however, impose quite a few constraints which differ from one to the other. It is these constraints which characterise a group or a society. In physico-chemical sciences, the major component i.e. the solvent determines the properties of a solution and so does the major group of the society determine the character of its members. Major efforts of a society are invested in bringing about uniformity of cohesive forces among all its components and in observing the established norms. Neither the solution nor the society allows the minor component to have its own identity and if the identity is likely to continue, it is rejected by the society and precipitated by the solution. The minority communities, the world over can serve as examples of such interactions. The majority norms have to be followed or else there would be conflicts as has been shown in the chapter on assimilation.

There are a number of factors which distort the equilibria of interaction. An attempt has been made herein to highlight the role of the number or quantity of interacting species and their affinity or liking for one another.

The equilibria in the previous pages have been depicted as in (1) to (5). According to the Law of Mass Action the rate of forward reaction depicted by ($\longrightarrow$) is proportional

to the concentration or quantity of interacting species like A and B and the velocity of reaction is given by:

$$V_{forward} = K_f (A)(B)$$

There is a simultaneous backward reaction, depicted by ($\longleftarrow$), since all inhibitions may not necessarily shed in the first few interactions. The backward reaction velocity is given by:

$$V_{backward} = K_b (AB)$$

At equilibrium i.e. at the point where as many ABs are formed or associated as are dissociated to A and B,

$$V_{forward} = V_{backward} \text{ and}$$

$$k_f (A)(B) = k_b (AB)$$

$$\text{Thus, } \frac{(AB)}{(A)(B)} = \frac{k_f}{k_b} = K$$

Equation (5) can be written more appropriately:

$$\begin{array}{l} A+B \rightleftharpoons AB \\ A+C \rightleftharpoons AC \\ B+C \rightleftharpoons BC \\ A+B+C \rightleftharpoons ABC \\ \hline 3A+3B+3C \rightleftharpoons AB+AC+BC+ABC \ldots\ldots\ldots (6) \end{array}$$

and at equilibrium

$$\frac{(AB)(AC)(BC)(ABC)}{(A)^3(B)^3(C)^3} = K_7$$

The equilibrium described by this model indicates that positive interaction of the various components of society is influenced by two factors, (i) the concentration effect i.e. the number of persons and (ii) the specific affinity

they have for one another. Thus, as demonstrated in the above example of a group where three types of persons, each represented by A, B and C interact with one another, their friendship linkage formation would depend upon the number of As, Bs and Cs and the special liking they have for one another.

The role of concentration or the number of different components may be elaborated further. Concentration of interacting species can be expressed in terms of fractions which, for a component i in a mixture, is given by X_i as follows:

$$X_i = \frac{\Sigma n_i}{n_i} \quad \ldots\ldots\ldots(7)$$

where n_i is the fractional number of species of component i in the mixture divided by the total number of species of all the components. Since partial pressure of each component of the mixture makes up the total pressure it is possible

$$= \Sigma P_i \quad \ldots\ldots\ldots(8)$$

to obtain (8) where P_i is the pressure exerted by n number of moles of component i.

Combining (7) and (8) we get (9), which suggests that partial pressure exerted by component i is given by total pressure and multiplied by the fraction X_i of the component.

$$P_i = X_i \quad \ldots\ldots\ldots(9)$$

In general the properties of pure substances can be calculated by multiplying the specific property by its molar volume. Thus, the molar property of a solution can be expressed by multiplying specific property of the mixture by its molar volume as:

$$P_m = PV_m$$

V_m here is the volume in which $\Sigma X_i = 1$, where X_i is the mole fraction of ith species and, thus, molar volume is calculated by $V_m = V \Sigma X_i . M_i$ in which V is the specific volume of the solution and M_i is the molecular weight of ith species.

In the model being discussed here molecules are the smallest particles of the individual substances and are being treated analogous to individual components of the society. In order to simplify the assumptions, it is proposed to count the molecular weight as the number of individuals forming a particular group e.g. those of A, B or C.

Supposing X_A is the fraction of majority component A, X_B is the number of members of species B and X_C that of Cs in the A B C society in various associated forms, such as monomer, dimer, trimer etc. designated as A_1, A_2, A_3 in the component A; B_1, B_2, B_3 in component B; C_1, C_2, C_3 in component C and interspecies forms like AB, AC, BC and ABC, the change in property of A would be given by (10) where P_A and X_A denote the property and fraction of the majority component A and X_i represents the sum of the fraction of the minority components B and C. Changes due to the latter can be expressed by dividing each component of equation (10) by X_B or X_C as in equation (11) or (12)

$$P = P_i X_i + P_A X_A \ldots\ldots\ldots (10)$$

$$\frac{P}{X_B} = P_i \frac{X_i}{X_B} + P_A \frac{X_A}{X_B} \ldots\ldots\ldots\ldots (11)$$

$$\frac{P}{X_C} = P_i \frac{X_i}{X_C} + P_A \frac{X_A}{X_C} \ldots\ldots\ldots\ldots (12)$$

This gives an account of the proportional change in character of the society as effected by components X_B or X_C. Simplification of (11) by putting $P = P/X_B$, S equa

to $P_A X_A$ and X_i the fraction of ith species equal to X_i/X_B, we get

$$P = P_i X_i + S \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (13)$$

It may be noted that the fraction X_i represents fraction of minority species B and C while majority species A is lumped separately as S, being calculated on the basis of its actual presence per fraction of species B and/or C. The overall change in character of society is given by (14). Both P and S have a large value compared with $P_i X_i$ and hence the presence of other interspecies would only slightly contribute to the overall property of the society.

$$P - S = P_i X_i \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (14)$$

(P-S) represents the apparent number of species B which being a minority component will have a small value. Now supposing one equivalent of B is assimilated by interaction with X_A equivalent of majority component A in a society where monomers and dimers or close friends exist, equation (14) suggests that the apparent property is dependent on the relative number of interacting species like A, B, C, AB, AC, BC and ABC. This implies that the socialization process would depend on positive interaction among the components. Equation (14) also suggests that when a society has too few persons of a kind other than the majority, the latter determines the character and norms of the society.

One could examine the above equations by assigning different characteristics to P which may be morality, integrity, Munafaqat etc. Equation (10) may be rewritten as:

what ?

$$\text{Morality of society ABC} = \left|\begin{matrix}\text{Morality of A x Number of} \\ \text{Members of community A}\end{matrix}\right| + \left|\begin{matrix}\text{Morality of B x Number of} \\ \text{Members of community B}\end{matrix}\right| + \left|\begin{matrix}\text{Morality of C x Number of} \\ \text{Members of community C}\end{matrix}\right|$$

Here community A forms the majority and hence its weightage in the A B C society would be high. Accordingly the morality of A would characterize the society, of course with certain modifications due to positive interaction meaning strong association with B and or C. For example, if the morality of A is high but it allows immorality of B to remain unchecked, the equilibrium conditions would not remain in favour of A but would be inclined towards B since immorality is contageous and it spreads fast in a permissive society. With each interaction of B with A there would be a conversion and the A B so formed would promote further immorality. Contrarily, a strongly religious society B could motivate the majority through its deeds as was possible for a small group of 17 migrants to Habasha at the first migration during the life time of the Prophet (b.p.u.h.)[5] when the former could motivate Najashi in its favour. Similarly only a handful of Sahabis have been instrumental in introducing Islam into far distant lands located in East and West of Arabia and they did so through strong associative interactions and practical demonstration of the true character of Muslims. The Christian Missionaries, though in minority were likewise able to reverse the equilibria established by the Muslims in Spain when the later rulers started practicing Munafaqat instead of Islam. Munafaqat is contageous and can easily be contracted by permissive societies seeking affluence; it therefore became the character of the society of Muslim Spain through the later part of their rule.

CHANGES OF STATE

The changes of state can be classified either as physical or chemical. In physical changes substances retain their identity and there is no change in composition of the substance taking part in the system. The changes of water into ice or evaporation of liquid into vapor do not involve change in composition since no new substance is formed. The properties of steam are different from water but both are different forms of water. These changes are

reversible. The solution of salt in water, the breaking of bottle into pieces mixing of sand with cement and water are also physical changes but they are irreversible.

Chemical changes involve changes in material composition and the products are not the same as the reactants. The molecules of the reactants break apart and their constituent atoms unite in different combinations and form different products.

Social changes could be viewed as a mix of physical and chemical changes. The interaction of A and B, in the party mentioned earlier, to form AB would be a social change whose equilibrium constant K, would be high if there are a number of As and Bs interacting, because the multiple of their numbers namely m and n determines K_1. On the other hand, the social changes between the interaction of A and C would either be unfavourable or at the most remain a physical change to be described as acquaintance. The value of the equilibrium constant K_2 would be low since s and p are small implying thereby that not many Cs mix with As and since the numerator op for deriving K_2 is low its value would also be low.

The formation of water from its elements is a chemical change. The structure of the gaseous reactants viz. hydrogen and oxygen, their admixture before reaction and the formation of water vapour is shown in the figures 4.1, 4.2 and 4.3. In the form of the equation this may be depicted as:

: : : :	+	0 0	=	0: 0: 2 molecules of water
2 molecules of hydrogen		1 molecule of oxygen		

Several billion gaseous molecules of hydrogen and oxygen interact with one another. When a small number of these interactions is successful, the molecules combine to form water.

Social interactions of the individuals of a group A

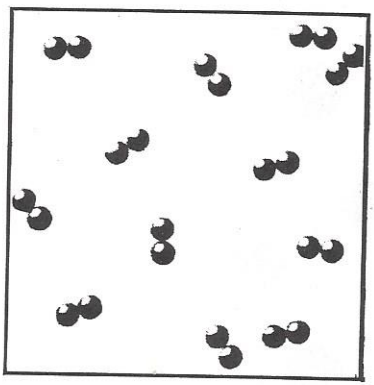


Fig. 4.1

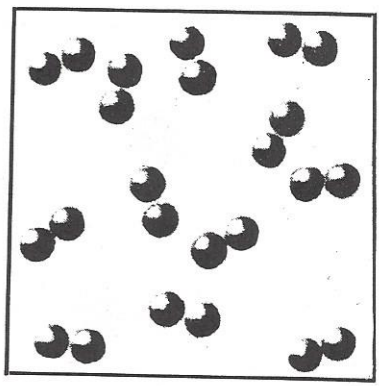


Fig. 4.2

The reactants, hydrogen and oxygen, before mixing

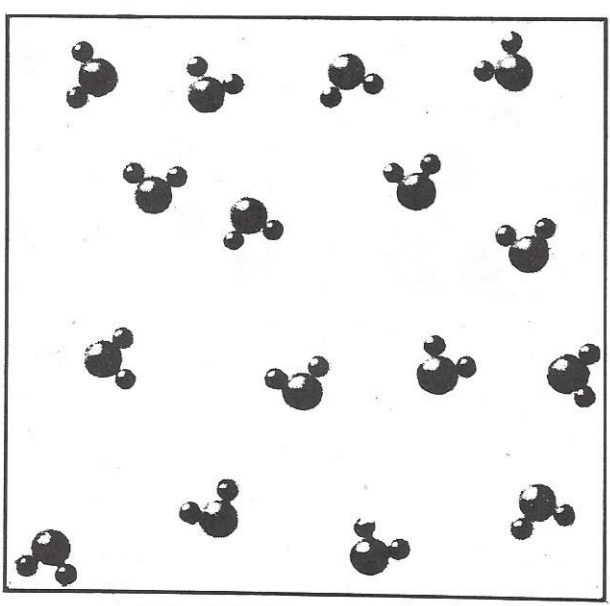


Fig. 4.3 The product: water

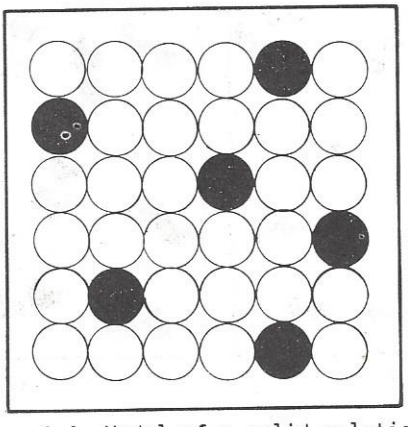


Fig. 4.4 Model of a solid solution

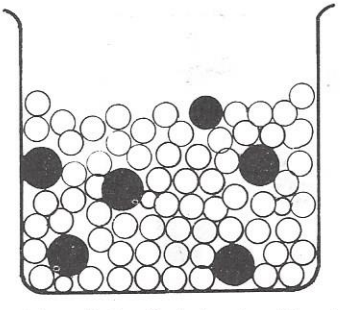


Fig. 4.5 Model of a liquid solution

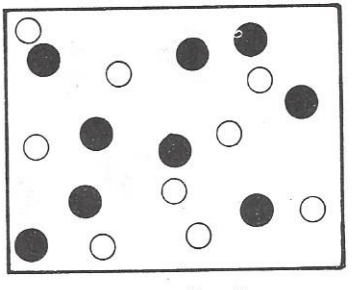


Fig. 4.6 Model of a gaseous solution

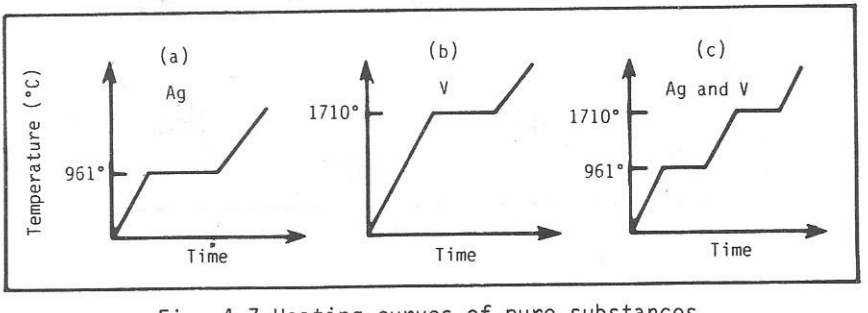
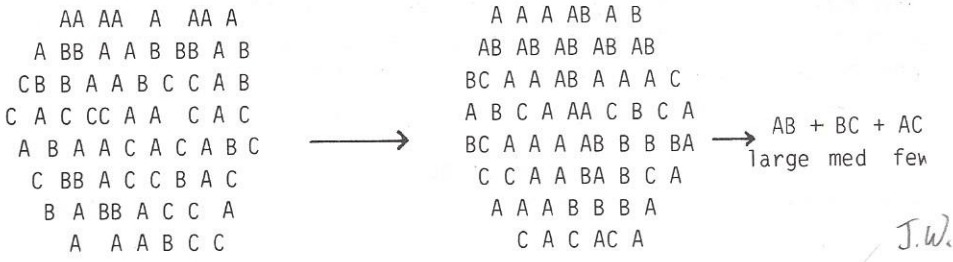


Fig. 4.7 Heating curves of pure substances

with those of group B and C may similarly be viewed as:



J.W. Gibbs

Associative interactions leading to formation of groups and/or merger of societies or individuals can also be interpreted by applying the phase rule given by G.W. Gibbs which, in the case of societies, deals with the constraint on the process of socialization mentioned in the preceding section. There are four parameters required to describe the changes of state; they are: (i) phases, (ii) components, (iii) degrees of freedom, and (iv) conditons for equilibria between phases. The relationship among phases, components and the degrees of freedom gives the Phase rule. The parameters have been defined as follows:

i) Phases: In physico chemical sense, phases are a set of systems which are uniform not only in chemical composition but also in physical state. Thus, a system may be homogeneous, constituting only one phase or may be heterogeneous comprising more than one. The one phase system is like a certain volume of air or a cake of mud while the heterogeneous system may be cracked ice with water which would consist of two phases. Similarly water and water vapour in air would be a two phase system but if sand is added to the latter it would form a three phase system which would be solid in the form of sand, liquid in the form of water and gas in the form of water vapour in the air above it.

Gases usually form a one phase system since they are miscible in all proportions unless there is a chemical reaction between them. Liquids depend on their mutual

miscibility and there can be one, two, or more phases constituting a system. Solids present a different case and a number of solid-solid interactions and transformations are possible and hence different phases can co-exist.

Cases of systems constituting various phases can be

Types of Solution

Solute	Solvent	Example
Gas.....	Gas	Air
Gas.....	Liquid	Soda Water
Gas.....	Solid	Hydrogen in palladium
Liquid.....	Gas	Water vapor in air
Liquid.....	Liquid	Alcohol and water
Liquid.....	Solid	Mercury in gold
Solid.....	Gas	Iodine vapor in air
Solid.....	Liquid	Sugar in water
Solid.....	Solid	Silver in lead

cited for the human society also. A single household or a nuclear family is the basic unit of a society. Its interaction with other,families, observing the same norms and having cordial relations produces a homogeneous society. On the other hand if this single unit say A is in any way different from the rest of the neighbourhood i.e. it does not observe the same norms, it would be singled out. This would form a heterogeneous society. If there is another unit say B whose interactions with the rest of the community as well as with A are different, a three phase system would come into being. A number of communities with different ethnic groups would form a multiple phase system.

ii) Components: It is possible to describe the composition of systems by means of the ingredients present in it, assuming that the latter would be a minimum number of chemically distinct constituents required to describe the composition of each phase. Each such constituent is the component of the system. The concentration of such consti-

tuents can be independently varied in the various phases. The number of components are usually the same as the number of different chemical constituents in the system but if there are interacting species also present in the system the number of distinct chemical reactions that can occur between the ingredients will have to be reduced from the total. For example, the decomposition product of calcium carbonate, $CaCO_3$ into CaO and CO_2 will have three constituents namely $CaCO_3$, CaO and CO_2. The chemical reaction $CaCO_3 \rightleftharpoons CaO + CO_2$ occurring in the system will have to be reduced and therefore the number of components would be: 3-1 = 2.

Different ethnic groups constituting a society can be considered as its components. The assimilation of the components by the majority society would eventually reduce the number of its components.

iii) Degrees of Freedom: In order to describe a system various degrees of freedom must also be stated. Such degrees of freedom are usually variables like pressure, temperature, volume, energy, concentration of the components in the different phases etc. In the consideration of phase equilibria the capacity factor given by the mass of the phases is not considered, on the other hand the intensity factor such as temperature, pressure and concentration have to be described. Among these variables only a certain number may be independently varied while the rest are fixed because of the thermodynamic requirements for the equilibrium. Thus, the number of intensive state variables which can be varied without changing the number of phases are called the number of degrees of freedom.

The state of certain pure gases may be completely specified by any two of the variables viz. pressure, temperature and density, since if two of these are known the third can be calculated. Such a system with two degrees of freedom is a bi-variant system. For the water - water vapour system, the pressure of vapour in equilibrium with water at any temperature is a fixed variable, i.e. only one variable needs to be specified to determine the state.

This is therefore a uni-variant system or one having only one degree of freedom.

In terms of human relations it is possible to see an analogy both in terms of the component and the degrees of freedom of a society. Thus in order to describe the components, which would be the constituents of a society, it is only necessary to identify the different groups. A society in which there is a mutual interaction or transformation towards assimilation is likely to be described as a distinct human entity and therefore such a system would not be counted as a two component system. For example, the Baluch race which has been assimilated in the Sind province, would not be counted as an independent component but the Indian Muslims in India form a two component system.

The variables required to describe the system are discussed in terms of pressure, temperature, volume, changes of concentration of the components in a solution and these have been described earlier.

iv) Conditions for Equilibrium between Phases: When there are several phases present in a system certain constraints are necessary for the existence of equilibrium. For thermal equilibrium it would be necessary that different phases should be at the same temperature, otherwise heat would be flowing from one phase to another.

In case of mechanical equilibria, the phases must be under the same pressure since otherwise one phase would expand or increase in volume at the expense of the other. This equilibrium condition is based on the assumption of constant volume and temperature while the former is based on constant volume and composition.

Having considered the conditions for equilibrium between phases in the previous pages it should be possible to see how it would work in the case of a society. In order to have peace in the environment, there should not be any heat generated in the system, i.e. there should

be no conflict between the groups because this would create local heat which would be transmitted from one community to the other. Similarly pressure on a society should be the same so that an equilibrium or a peaceful atmosphere prevails otherwise a selective pressure on one community would affect the other community in one or the other form. Same is also the case with equilibrium arising out of mutual interaction in the case of societies.

Physico-Chemical principles suggest a relationship for the formation of different groups in terms of the number of components present and the degree of freedom the system can allow. If C is the number of components, P is the phase which the components can take e.g. monomer, dimer, trimer etc. and if the degree of freedom allowed is F, the equation for the formation of sub-groups is given by

$$F = C-P + 2$$

In other words the number of degrees of freedom equals the number of variables required to describe the system less the number that cannot be independently varied. The total variables required to describe the system are PC + 2.

If there are P phases, there would be equations like $X_i=1$ and there are P fractions or sub-groups which need not be specified since they can be derived by calculation. The number of independent variables which should be specified is thus

$$PC + 2 - P \text{ or } P(C-1) + 2$$

This is the Phase rule given by J.W. Gibbs.

At the stage of equilibria such as those reached in equation 1 to 9 during the socialization process described in the earlier section, the interaction occurs so that component i changes from group to group but each such change has to follow certain restraints. Each condition imposed on the system decreases the variance by one and there are therefore C(P-1) of these conditions.

The degrees of freedom are equal to the total required variables minus the restraining conditions thus

$$F = C-P(C-1)+2-C(P-1)$$

For a system or society having only one component C=1 and F=3-P then according to equation (1) three different cases are possible:

(i) P=1, F=2 (ii) P=2, F=1 (iii) P=3, F=0

In (i) members of group A or the As may occur as individuals like A_1, A_2, A_3 etc. because of the maximum degree of freedom, in (ii) they do so as AA because of the reduction in degree of freedom by one, and in (iii) which is an invariant system the degree of freedom is zero and hence As are present as conglomerates like AAA.

For the interaction among A and B members of two different societies in a party, the number of components is two and hence F+3-P+2 or F=4-P, implying that there are 4 different interactions possible in such a situation. These are:

(i) P=1, F=3, (ii) P=2, F=2, (iii) P=3, F=1, (iv) P=4, F=0

In this system when the degrees of freedom are 3 and phase is one As and Bs would occur as monomers or as individuals A and B. When F is 2, the loss in the degree of freedom suggests shedding of inhibitions. The value of p=2 implies that the bivariant system would consist of dimers like AA or BB, etc. Inhibitions are further removed when F=1 or when the degree of freedom is substantially reduced and trimers like AAA, BBB, are formed. When F=0 an invariant system is obtained where an interspecies reaction takes place and there is formation of ABs etc.

It may be seen from the above that only in non-variant systems would conglomeration or interspecies interaction

take place otherwise the general tendency would be to form dimers or trimers or to remain as individual species. This model suggests that inhibitions have to be substantially removed so that the mixing between A and B or A and C may take place in the above party or else As and Bs may not interact and monomers and dimers or trimers may form, depending on the degree of freedom the system enjoys. The above derivations may be seen to be applicable to the case of the heterogenous society comprising A, a city dweller, B, an agriculturist and C, a tribesman, mentioned in the earlier section.

The maximum number of degrees of freedom in the case of a bivariant system is 2 and hence a one component system can be represented by a two dimensional plot. The variables are commonly pressure and temperature. The water system is depicted in the following diagram which is distri-

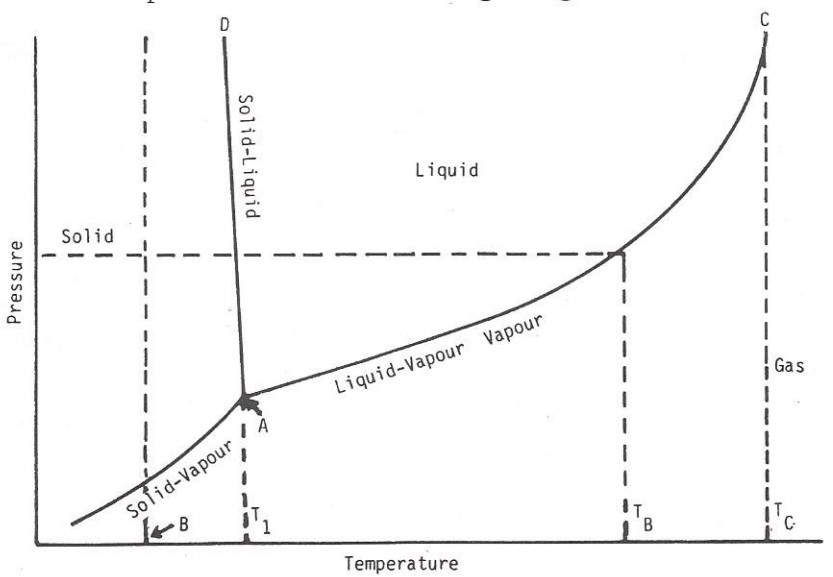


Fig. 4.8 Equilibria between phases of water

buted into three areas, specifying fields of existence of ice, liquid water and its vapour. These are the inter-phase areas and within these areas the system is bi-variant,

since pressure and temperature can be independently varied. There are lines specifying two phases, i.e. at the common line the two phases can co-exist at equilibrium. For example, at the curve AC, the vapour and liquid can co-exist. There is only a single pressure at which the water vapour would be in equilibrium with the liquid. Thus, the system on this line is a uni-variant system having only one degree of freedom. There is naturally an upper limit to this separation of phases which occurs in the diagram at point C and this is the critical point beyond which the liquid phase is no longer distinct and passes in entriety into vapour phase. Similarly, the sublimation pressure curve of ice which gives the pressure of water vapour in equilibrium with solid ice is given by curve AB while curve AD divides the liquid and water phase regions. The dependence of the melting point of ice on pressure is indicated by the curve AD.

The three curves are found to intersect at point A where solid, liquid and the vapour phases are simultaneously at equilibrium. This is the triple point at 270.16°K and 4.579 mm pressure. At this point it is an invariant system having no degrees of freedom and neither pressure nor temperature can be altered even slightly without the loss of any one phase. It may be seen from these curves that it is possible to lower the melting point of ice by increasing the pressure which is in line with the Le Chatelier's principle that an increase in pressure would decrease the melting point.

When the phase rule is considered in the light of the interaction prevailing in societies the triple point such as the one in the case of water is found to exist in the human system also. It may be pointed out that this point is located at a very low pressure which is almost complete vacuum and at quite low temperature. At the solidification point usually the liquids do not enjoy the vibrational degrees of freedom. Therefore, the activities are at standstill. Similarly, under high vacuum the vapours also have decreasing chances of interaction with the other molecules. Under the

circumstances the low temperature and high vaccum give rise to very low interaction among the different species in the system. The human beings are therefore likely to behave at absolute peace and without commotion with the different groups in the community.

Reduced human interaction is possible among human beings if there are not many persons forming the society, and also if no heat is generated in case of these interactions. Interspecies interaction also depends on concentration of majority species and it would require considerable constraint to bring different groups to interact and form a friendly linkage.

Extending this observation to the interaction in the party mentioned earlier it would be noted that A,B and C can be identified as the three phases of the same society and as shown in the figure it is only at point O where A,B and C would coexist and this condition would be severely restrained. As, Bs and Cs may remain as individual species in the regions marked A, B and C. A and B would coexist along the line OA while B and C would do so along the line OC and A and C would group together along OA. This suggests that interspecies interaction can occur only on a limited scale. The area covered by A,B and C would depend on the number of interactions leading to the formation of inter-species and this would determine the social status of the society i.e. whether the groups mix with one another or are inhibited in their approach.

Chapter V

AFFINITY AND SOCIALIZATION

The attempt in the earlier pages to correlate miscibility and human interaction with the positive and negative deviations of solutions from ideality and consequently the escaping tendency of a component from solution or of an individual from a society, can be dealt with from another angle. The term affinity, used in the earlier pages for describing the process of socialization, is the liking one species has for the other. This chapter would be concerned with free energy changes or the driving force of social interaction in which affinity plays a major role.

Affinity and Fugacity

Positive and negative deviations from ideality are related to higher or lower escaping tendencies or fugacities in solution. The same when expressed in terms of free energy changes, imply that the components having higher fugacity in solution are in a state of low free energy and vice versa. Thus the escaping tendency is related inversely to the free energy of the component. Affinity and fugacity are also similarly inter-related and it is found that higher the affinity or liking of one component for the other, the lower would be the escaping tendency. Affinities can, therefore, be measured in terms of free energy changes since the two are directly related.

Positive deviation from ideality in solutions has been seen to give rise to immiscibility if the fugacity of the components in solution is greater than pure liquids. When interpreted in terms of affinities this would mean that if the affinity between A and A or B and B is lower than between A and B, there would be a negative deviation.

An ideal condition would be obtained when the affinities between A and A, B and B and A and B are the same.

Affinities and fugacities characterise the behaviour of individuals in a society. If an individual has no affinity for the other in the same society it will come off it. The son in a joint family system remains in the family just as long as the affinity of the father with the son, of mother with the son and of the father with the mother are to his observations the same. Once he observes differences, he starts discovering the limiting parameters. It is here that he finds dissimilarities and as would be seen later, the equilibrium is disturbed and reverses its direction.

The observations regarding affinity are as old as civilization and in fact they have been introduced into physical sciences through the study of human nature. The chemical reactions were interpreted by alchemists as a love which the reactants had for each other. This type of interpretation was, however, a controvercial point as might appear from what Robert Boyle recorded in 1661. "I look upon amity and enmity as affections of intelligent beings and I have not yet found it explained by any, how those appetites can be placed in bodies inanimate and devoid of knowledge or of so much as sense". Obviously, the simulations had been pushed too far and Boyle had to record his note of dissent but if one is cautious, these similarities are indeed a key to the understanding of the physical phenomena on the one hand and human behaviour on the other. Issac Newton, after his success with the gravitational forces, tried to interpret the chemical interactions in terms of gravitational attractions. In 1701, he described the reaction between sulphuric acid and copper or between iron and salt of tartar as the attraction of the spirit by the fixed bodies.

It is possible to estimate affinity from the force of attraction between two masses m_1 and m_2 since it is known to be directly proportional to their product and inversely

$$f \alpha \frac{m_1 \cdot m_2}{r_{12}^2} \quad \text{.....(5.1)}$$

to the square of their separation, r_{12} given by (5.1). For charged bodies, mass m_1 and m_2 may be replaced by charges q_1 and q_2 and (5.1) becomes:

$$f \alpha \frac{q_1 \cdot q_2}{r_{12}^2} \quad \text{.....(5.2)}$$

Thus, the higher the product of charges and lower the distance of separation, the larger would be the forces of attraction or affinity between two bodies.

Affinity in the case of individuals and societies would be concerned more with material and spiritual gains than mere likes and dislikes as suggested for material bodies possessing masses m_1 and m_2 and charges q_1 and q_2. Likes and dislikes for societies comprise (a) blood relationship, (b) kinship, (c) clan and tribal linkages, (d) sex, (e) material and monetary benefits, (f) patronage of ideas and beliefs, (g) conformity with norms, (h) fraternity, (i) adaptibility and (j) ability to remove misunderstanding and develop understanding; q_1 and q_2 should represent these terms so that an estimate of affinity is possible. It is well known that blood relationship has higher affinity than other terms and accordingly it has higher weightage. Blood relations from the same clan would have higher affinity than those who are members of the clan. Persons who are blood relations but do not follow the same norms, and adhere to faiths or Imams, or churches or belong to ethnic groups different from one another, have accordingly lower affinities for each other. Thus a scale of affinity for societies can be constructed by using the above terms and assigning scores to each of them, the higher the score the greater will be the affinity which an individual or society has for the other.

In equation 5.2 the denominator is also important for estimating affinity because it is related to distance; the closer the relation the higher is the affinity. However, even when such persons come so close together that there is clash of interest or when the zone of their command overlaps there is a mutual repulsion and they have to be warned to maintain a distance. This is similar to the case of ions, for example sodium and chlorine ions in the lattice of sodium chloride. When the ions are brought so close together that their electron clouds begin to overlap, there is mutual repulsion between the positively charged nuclei. The two ions therefore maintain a fixed internuclear distance. These distances are different and characteristic of each species whether they are ions or individuals of a society. Being placed in the denominator it implies correctly that it is only at close distances that affinities are large and hence significant. Conversely at large distances they are low and to get out of the influence of people who matter e.g. chiefs, landlords or the dominant relatives, individuals migrate to different and far off lands.

The term affinity may be illustrated in the context of the Pakistani society. It was noted in the earlier Chapter that starting from the early seventies there is a great rush of Pakistanis to the Middle East. People who were seeking emigration preferred to go to the Middle East, rather than to UK or USA as was the case in the early sixties. The preference for the former, among other things, was because they would work for their Muslim brethren and would be able to get the same monetary benefits as in the western land. Furthermore, there prevails a general atmosphere of dislike, amounting to hatred of the natives and more of language barrier in the West than in the Middle East. If one analyses the situation in terms of affinity there would be found attraction for a Pakistani in terms of money, fraternity, adaptability, absence of dislike and greater chances of developing an understanding. In the West, on the other hand, he may get the same amount of money but there is absence of fraternity and a dominant

hatred for coloured skins. The interaction between A (Pakistani) and B (Arab) is likely to result in better understanding because the two happen to have quite a few interacting factors in common. On the other hand, interaction between A (Pakistani) and C (Westerner) might even not take place and may likely lead to segregation. The affinity in the former case is much larger than is to be found in the latter environment.

It may, however, be pointed out here that affinity of a Pakistani for a Westerner is of economic nature only and there seem little common grounds among them in particular and with Asians in general. The Blacks are relatively easily acceptable to the Whites because their likes and dislikes are mostly the same. The Blacks are associated with music and sports, the Chinese with Mao's revolution and the attainments thereafter, the Japanese and Koreans with their economic and industrial progress, the Indians with Gandhi, the Arabs with their money but the Pakistanis are known for the short cut methods adopted in getting down to business. They have acquired property or real estate and own them wherever they can. Unlike the Blacks, they have not so far brought any honour to their country. They provide a helping hand in very many walks of life but in menial positions as skilled and semiskilled workers. However, the health services are being manned by Pakistanis and South Asian doctors. Socially the South Asians are classed in the same category of immiscibles. They have relatively more affinity for each other than with the Black or the Whites. This is why the Blacks attacked the South Asians as a class or as one ethnic group, during the riots which broke out in England in 1985. In the scale of affinity proposed above, the score of the Pakistani community which has migrated to UK, USA or Canada is for a, b, c and e and is low because it has done so for economic reasons and has sought affinity of its own members who have transplanted a small South Asian environment there.

Egyptians, Sudanese, Jordanians, Yemenis, Indians,

Koreans and Philippinos have also sought employment in UAE but the general observation is that these communities are well-behaved and docile. They devote to legitimate earning knowing that they are in a Muslim country. The communities speaking Arabic enjoy more previleges and develop better employer-employee understanding compared with others since it gives them a sense of belonging to the Ummah. They are all good labourers as are the Pakistanis. For Pakistanis and other Asians who do not speak Arabic, language draws an ethnic boundary or the 'distance' mentioned above.

Pakistani society has been mentioned earlier as being heterogenous and comprises city dwellers, agriculturists and tribesmen. The fugacity of each category is different. For the first two category of workers, the main term in the affinity scale is money. The city dwellers are particularly socially and culturally malleable. They have made good money and have got their family members also employed in UAE. A large section of agriculturists and tribesmen are the manual labourers. They lead a harsh life, working desperately to earn and return home with the expected riches. They are lonely and live in a shanty town inhabited by labourers from different countries. The living condition is far below the average standard; there are stagnant pools, with no sanitation in sight. The rooms they live in are small and shared by another half a dozen members. In spite of heavy odds the persons would like their contract renewed every year because of the monetary benefits and the affinity for such considerations.

For the city dwellers and some agriculturists from Pakistan there is cultural assimilation because of a large score on various terms in the affinity scale, but for the tribesmen and other labourers there is segregation. The fact that the latter class continues to live this type of life suggests that affinity is related to terms like monetary benefits, fraternity and acceptability under Ummah considerations and adjustment in the segregated environment of workers faced with identical situations. This is the

essence of obtaining negative deviation which makes components miscible and if miscibility is attained fugacity is retarded. Therefore if a person migrates to a place of preference, as just stated, the fugacity is lowered and he achieves the objective. Affinity in other words produces a driving or a motivating force. A person on the other hand becomes fugaceous and decides not to work in the existing environment or is forced to migrate if the environmental conditions are such that he is not satisfied with them. Satisfaction is a relative term and so is affinity. The ultimate decision in favour of migration is not just due to job satisfaction but to a number of other factors including monetary considerations as mentioned in the affinity scale. If a person is able to earn ten times more e.g. in UAE, he sacrifices his affinity to his kith and kin in favour of pecuniary benefits and migrates. He is thus able to meet the requirements of the family and also to show to his neighbour the higher status that he attains by earning abroad. Some of the fugaceous persons seem to feel inferior in their own environment, may be, because of lack of education and skill. They think that whatever they are getting is much lower than what they can get. They therefore use a short-cut method. Societies looking for affluence are never satisfied with whatever they get and do not practice simple living, where alone one may find satisfaction. The affinity for values is thus lower than for monetory considerations; result is that the number of people deviating from ideality seems to be increasing every day and this is perhaps one of the main reasons for the Pakistanis being more fugaceous than any other national, as was noted in the earlier chapters.

The model just suggested relates affinity to satisfaction of need and is comparable with that given by Taylor and Herzberg. These authors have analysed the events which lead to satisfaction or dissatisfaction at work and it is assumed that the latter are due to absence or presence of factors producing such feelings.

According to Taylor, if more money is paid to a person

he would usually be satisfied. Herzberg has on the other hand proposed two factors which determine job satisfaction and improve productivity. These have been called (1) maintenance or hygiene factors which are associated with happiness and cover such matters as work conditions, salary, status, security etc. and (2) motivation factors which cover recognition, achievement, responsibility, advancement, growth etc. which are a source of happiness and liking for the job. The former is related to contentment. If a person develops a strong affinity, he produces a strong driving force which is responsible for attainment of objectives. Doing useful work is like obtaining satisfaction in the work environment. Examples cited earlier show that motivation as well as maintenance factors are related to affinity, because doing useful work is the ultimate aim in the two cases. If a person gains recognition in the eyes of his kith and kin or persons who matter to him, he is satisfied. If satisfaction is not to be obtained by remaining in the same work environment, there would be a tendency to migrate. The law of affinity, driving force and equilibria is thus related to Herzberg's model for motivation.

Free Energy Changes

In order to understand the behaviour of an individual in a society, an interpretation in terms of his likes and dislikes or the positive and negative deviations or attractive and repulsive forces leads one to the consideration of affinities. The positive and negative deviations from ideal behaviour of solutions involve free energy changes. Thus a component would have a low escaping tendency in solution than in its pure form, if it is in a state of low free energy. The understanding of chemical reactions in terms of free energy changes is now well established and in trying the interpretation of human behaviour with respect to physical phenomena, it would be pertinent to describe the laws of chemical combination.

The true measure of chemical affinities is obtained from changes in free energy which gives the driving force

of a reaction. A system having two species A and B reacting to yield C and D is said to be in equilibrium if the rates of forward (F) and reverse (R) reactions are the same.

$$A + B \rightleftharpoons C + D \ldots\ldots\ldots (5.3)$$

This in physical chemistry is the law of Mass Action of Guldberg and Waage. The rate of the forward (F) reaction in the above equation is proportional to the concentration of A and B and this may be written as in equation (5.4)

$$aA + bB \rightleftharpoons cC + dD \ldots\ldots\ldots (5.4)$$

where A and B are reactants, C and D are products and a,b,c, and d are their concentrations (or quantities). This law shows that chemical affinity depends on the chemical nature of the species and on the concentration under specific conditions of pressure and temperature.

The system (5.4) is said to be in equilibrium if the free energy change or driving force is zero, no net work is accordingly obtained. It may be mentioned that the equilibrium condition does not imply cessation of all activities but indicates status quo. When the free energy change ΔF is positive, the reaction will not take place unless some work is put into the system. When the change is negative the reaction is spontaneous and useful net work is obtained. The more negative the free energy changes, the farther is the reaction removed from equilibrium.

VALUES OF FREE ENERGY (Δ F) FOR SOME CHEMICAL REACTIONS

REACTION		ΔF (KCal)	Nature of Reaction
$Pb_{(s)} + Br_{2(1)}$	$Pb\,Br_{2(s)}$	- 62.1	Spontaneous
$\frac{1}{2}H_{2(g)} + \frac{1}{2}Cl_{2(g)}$	$HCl_{(g)}$	- 22.8	Spontaneous
$CO_{(g)} + \frac{1}{2}O_{2(g)}$	$CO_{2(g)}$	- 61.5	Spontaneous
$CaCO_{3(s)}$	$CaO_{(s)} + O_{2(g)}$	+ 31.1	Energy input essential
$H_2O_{(1)}$	$H_{2(g)} + \frac{1}{2}O_{2(g)}$	+ 56.7	Energy input essential

Applying the above principles to the society it may be observed that under equilibrium conditions the two communities A and B may continue to put up with one another; the interaction among the components gives a product AB. Here the driving force is zero and the forward reaction is compensated by dissociation as represented by

$$A + B \rightleftharpoons AB \quad \ldots\ldots\ldots (5.5)$$

equation (5.5). In the system given by (5.5) there are just as many ABs being formed as are dissociated into A and B. This represents a society lacking a driving force, meaning thereby that its future, instead of being progressive is only like its past. It might be difficult to find a society with no driving force these days but there are tribes in the remote corners of the world still trying to maintain themselves, in primitive conditions and have little affinity for the outside world. Any attempt to socialize them would, in the present context, give their society a driving force. In order to obtain useful work from this system, some work will have to be put in, for example the efforts of the missionaries, travelling to far off places is an important input to improve the lot of such lithargic societies. The useful work in the form of missionary dedication is analogous to what is known as Motivation or reinforcement in human behaviour sciences.

Another example of a lack of driving force is provided by a group of participants taking an intensive course. The instructors shower them with knowledge but there may be very little absorption or product formation. The forward reaction materializing in the uptake of knowledge may be compensated by dissociation, observed by the participants coming out of the class room without gaining anything. A good teacher or a counsellor may create affinity with the subject and provide sufficient driving force which may shift the above equilibrium to the right hand side and useful work or results may be obtained that may be observed by the active response of the participants.

The technique used by religion is through the differentiation between the moral and immoral or virtuous and sinful. Heaven and Hell furnish the positive and negative reinforcements. Islam, however, is much beyond mere Heaven and Hell type of reinforcement since it gives a way of life which has been practiced in words and deeds starting with the lifetime of the Prophet (p.b.u.h.). The religion created sharp boundaries between moral and immoral values and by creating affinity for the former it has been able to prevail upon the latter.

The Islamic Society provides a very good example of the shift of equilibrium on putting in useful work into the system. The equilibrium in the Islamic Society indeed requires one single driving force to obtain useful work. The call for prayer or for Jehad are some such examples. Once there is a call, in the name of Allah, there is spontaneous input of useful net work and the equilibrium is shifted to the right i.e. the rate of backward reactions is lowered to complete the shift in equilibrium; the person is motivated to respond to the call and act positively. At the call for prayer people leave aside their engagements and rush for prayers which is a positive shift to the commitment to moral values and affinities for them.

If the driving force in a reaction is large i.e. if the free energy change is a negative quantity, it does not necessarily imply that the reaction would occur under the given conditions. Hydrogen and oxygen, for example, react to form water but dry oxygen and hydrogen may be stored together without reaction for an indefinite period although their free energy is calculated to be a large negative quantity which means the driving force of the reaction is very high and should occur spontaneously. If, however, a small quantity of catalyst, for example platinum sponge or a drop of water is introduced into the system, the reaction occurs with explosive violence. In the dry condition the reaction does not occur in spite of the requirements being fulfilled. The rate of attainment of equilibrium in such cases depends on different factors, besides affinities

and free energy changes.

Human behaviour appears to conform to some of the laws of physical sciences but it is quite likely that they may not hold good strictly at times. However if the exceptions have a basis, a generalization may again be possible. Prediction based on these generalizations could be made in a number of cases but with caution. Quite a few incidents which have occurred in history can thus be interpreted on the basis of the physical laws of which mention may be made of the following:

The will of the Muslims in India to identify themselves from the Hindus needed a person like Sir Syed Ahmed Khan to unite them and to bring them on a common platform so as to face the challenges posed by the Hindus as well as the British. The will to have a separate nation for the Muslims was there but it needed a catalyst in Mohammad Ali Jinnah to motivate and mobilise their opinion and the reaction was so spontaneous as to get India divided into India and Pakistan.

The negative forces for separation viz. immiscibility is there in a solution but it needs either a catalyst or another reactant to precipitate and separate out the components or the product. The fugacity of the Bengalese to escape from a United Pakistan and to separate out from West Pakistan was there but it needed a catalyst in Mujeebur Rehman and the blessings of India to crystallize out Bangla Desh as a separate state.

Some time resistance to a reaction may occur. Although there may be a large negative change in free energy and high affinity among the reactants, yet the reaction may not occur. Such examples are provided by metals like aluminium and magnesium which burn in air when ignited. The oxidation reaction of these metals, however, does not occur easily because their surfaces are exposed to air which covers them with a thin film of their oxide. The oxidation reaction permeates through the surface at a very slow rate. But if the metals are somehow burnt by an

oxidizing agent, there is high heat generated on burning. The incendiary bombs and the thermite reactions are some of the examples of the utilization of such high heats of reaction.

The resistance to change is visible in the society also. The Chinese seemed to be lethargic people in the past and they were usually compared by the British with doped persons. They were a rather oxidized or rusted society but it did not lack the driving force which ultimately was found in the explosive personality of Mao Tse Tung who aroused their feelings. The reaction occured with spontaneity, with the result that now it is a completely changed society i.e. the equilibrium is now totally shifted towards the right of the arrows and the whole nation is on the path of progress with its future much better than the past.

The equilibrium of a reaction depends on the concentration, temperature and pressure which must be specified in order to describe the equilibrium conditions. In the case of society it may not be difficult to visualize the pressure, for example, the political pressure. Temperature can be described as the heat in the discussion or interaction of the components, which may occur when either political pressure is being exerted or is released. Similarly, concentration is the number of components in the system or society taking part in the interaction.

The three physical or environmental conditions for the equilibrium can be exemplified by those prevailing in pre-partition India. The political pressure from both Hindus and Muslims pushed the British out of India. The forward reaction here is the interaction between the Indians and the British and this gave rise to a series of violent riots in the sub-continent. The British could not withstand the political and social pressure. This resulted in the shift of equilibrium towards the right which ultimately brought independence. The interaction among the Hindus and Muslims could only be brought under control by the use

of police pressure otherwise the hostilities might have been difficult to restrain.

The speeches made by Hindu extremists generated high heat in their society. Their emotions were set so high as to interact with violent force with the Muslims and this led to widespread riots, killings, arson and looting.

The demand through Direct Action Day generated immense heat among the Muslims and they started resorting to force, though limited, without caring for any eventuality. The heat of this reaction was enough to demonstrate that the Muslims did have a unity of purpose in asking for a separate homeland.

The importance of concentration of components involved in violent interactions may also be demonstrated by the riots which occured in either the Hindu or Muslim rich areas in India. Riots occured at places where the number of a certain member of the community were sufficient to assert their existence. At places where there was a minority of Muslims the latter usually compromised with the Hindus and very few riots, if at all, were reported from there. On the other hand, places, where the Muslim population was sufficiently large, of the order of about 10% of the total population, were faced with heavy and frequent riots. The compromise reached in the earlier case presents a case similar to a very dilute solution which is more like an ideal solution. Thus the major component of the society interacted with the minority in the same manner as with its own members and the reaction did not proceed with explosive violence or towards riot so far as the Hindus were concerned. In such an interaction the equilibrium was shifted to right hand side giving a peaceful society as in equation (5.6). In the case of a significant minority the rate of forward reaction was the same as that of the backward reaction. This resulted in an unstable equilibrium.

Hindu Majority + Small Muslim Minority $\longrightarrow$ Peaceful Society....(5.6)

This shows that reaction (5.6) did not occur because the peaceful society was reverting or dissociating into its components and the majority was bent upon supremacy. The situation corresponded to equation (5.7). The riots

$$\text{Hindu Majority} + \underset{\text{Muslim Minority}}{\text{Significant}} \longrightarrow \text{Hindu Dominated Society} \quad \ldots(5.7)$$

usually occur in India at such places where concentration of the major component is much larger and that of the minority is not insignificant, for example in Ahmedabad, Gujrat in India. The interaction among the components is much removed from ideality and there is immiscibility and segregation. Consequently there has been explosive violence several times in a row during the last few years.

Le Chatelier's Principle

The interactions and equilibria mentioned above are governed by the principle of Le Chatelier, whereby changes in the variables like pressure, temperature and concentration may cause a shift in the position of equilibrium in a direction that tends to counteract the changes in the variable under consideration. This principle indicates that if heat is evolved in a reaction, increasing the temperature will lead to its reversal. A decrease in pressure will shift the equilibrium position towards the right. And similarly the position will be changed by a change in the concentration. It is quite usual to find an application of this principle in the case of a society.

The interactions taking place in the society can be slowed down by (1) diluting the reactants or reducing the number of members of a component, (2) by cooling them down, or not letting members get too excited or (3) by relieving the pressure or by not creating too many barriers. The three conditions may again be understood by the example of the pre-partition Indian society, where after the first major riots of 1942, the Muslims migrated to places

of the majority Muslim areas. This reduced the concentration or number of members of minority community. There was dilution of the Muslim community and this shifted the equilibrium towards a peaceful society as in equation (5.6). Peace committees were formed when riots broke out in 1946-47. Speeches were made by leaders to cool down the tense atmosphere and it was observed that peace did return to the community. It could appropriately be said that in this case the equilibrium was frozen. Similarly, if the interaction was high and if sufficient pressure from within the community prevailed, there was a cessation of hostility. The pressure within the community was sufficient to relieve the total community from a larger pressure from police or military authorities which is exerted in such cases to avert the danger of spreading the riots and retaliations.

One could consider the impact of industrialization in this context. The stress created by industrialization has caused irreversible changes in the social fabric. The local craftsmen were the first to suffer because the economic pressure of the machine-made products, which were reproducible and for which mass production could be achieved, was unbearable. According to Le Chatelier's principle, that reaction in such pressurised competetive situations would be favoured which reduces the number of reactant species and hence relieves the stress. The local craftsmen and small traders had to abandon their trade.

* – CURIOUS

The stress due to mass production as a consequence of industrialization has brought about the present mass movement of rural workers to urban areas, mass housing, mass transport, mass media for communication, advertizing for mass sales and massing of workers in factories, of educated persons in offices and of children in schools. Those who opt to live in such mechanised systems or societies have to move fast so that they fit into and become part of the rapidly moving cycle. The tension, noise and fast pace in which a person has to adjust calls for extra work by the mind and body which yield to the pressure and wear out rapidly. The stresses and pressures so

generated appear in the form of blood pressure, heart ailment or ulcers even in middle aged persons.

The situations which a person in such an environment is faced with can be described by an organic chemical reaction. These reactions, unlike the inorganic reactions, are not straight forward giving the predicted products only. They involve side reactions and yield by-products and co-products. The interaction represented by equation (5.5) could therefore be modified into an irreversible

$$A + B \xrightarrow[\Delta F]{\text{Motivation}} AB + \text{Stress} \quad \ldots\ldots\ldots\ldots (5.8)$$

equation (5.8). The driving force or the free energy change appears in the form of tensions as the interaction of B to fit into the scheme of the majority species A proceeds to maturity, or as the person opts to fit into the fast moving urban environment.

Stress conditions may be elucidated by the synthesis of ammonia from one volume of nitrogen and three volumes of hydrogen which is accompanied by heat as in equation

$$N_2 + 3H_2 \longrightarrow 2NH_3 + \text{Heat} \quad \ldots\ldots\ldots (5.9)$$

(5.9). It has been found that the higher the temperature of reaction, the lower will be the yield of ammonia; heat being the stress applied to the equilibrium. By absorbing heat there would be some relief in the stress on the system. The application of the stress of increased pressure on the Nitrogen-Hydrogen system facilitates reduction of volume and also the number of molecules from four to two. Increasing the pressure thus increases the yield and favours the reaction. This is apparently applicable to the societies and because of the gains in taking a risk it suggests as

to why a person looks for stress situations and tries to fit into a mechanised life style knowing fully well that it involves by-products like tensions, mental fatigues, blood pressure and heart failure.

The absorption of heat in the case of individual undergoing stress is analogous to containing emotions. Those who migrate to a foreign country and leave their homes due to pressure of the society undertake and absorb great pains. They pay heavy amount to agents for securing a visa and an employment. Visa sale is itself a lucrative business and involves corrupt practices of agents and promoters who at times are cheated for millions by fake employers. There are cases of employers who make profits at the cost of illiterate villagers. When the individuals have undergone all such pressures from within and finally settle down to work, they find themselves under another social pressure: harsh working condition, strangeness of the environment, social isolation, cultural shock but sudden acquisition of a lot of wealth compensates for all the trouble and justifies the risk and stress.

The affinity for belonging to the Ummah somehow suffers a cultural shock. Pakistanis expect their brethren in UAE to meet and interact in the framework of Islam and to follow the social actions and rituals prescribed by the religion. Departure from Islamic values and inequality in economic levels, however, soon makes them realize that they have been hired to work as employees. The social as well as economic pressure aligns the like minded employees and this gives birth to reversal of affinities. Ethnicity is revived and there develops a tendency towards immiscibility. This could be averted as in the case of ammonia production by allowing the pressure to reduce the volume. This is possible by considering the total framework of Muslim Ummah in terms of an ideal society which makes no distinction among races and allows no chance to ethnicity. The latter develops because there is evolution of heat due to cultural shock. If favourable results are to be obtained, sentiments and emotions will have to be controlled. This, on the

employee side, is already being practised by the Egyptians, Sudanese, Jordanians as well as the non-Muslims viz. Koreans, Philipinos, by following the employer-employee relations. This attitude allows a better chance of acceptability and hence affinity for a certain society, in general terms.

pretty decent *

Looking for stress situations constitutes the guiding principles of the major events from ancient times to date. They can be interpreted on lines similar to the reactions 5.8 or 5.9 following Le Chatelier's Principle. Affinity, pressure, heat, number and quantity of reactants, environmental conditions, solubility or sociability of individual and the free energy or driving force of the reaction comprise some of the main factors which bring about interaction among the components of the society.

Survival of the earliest man was in fact a stress situation and was achieved by pressurizing the enemies and wild animals through attack with implements developed by him, by making use of fire and by using skins to keep him warm through long winters of the ice age. The disappearance of the ice-sheet changed the environmental conditions. It became warmer than before and hence the big animals disappeared. The stress produced by rise of temperature put immense strain on these animals and this led to an irreversible change to which the physiology of their system could not adjust and they were annihiliated. This is in contrast with the capability of man to adjust to the vagaries of the environment. The changed conditions did not demand a nomadic character since he did not have to chase his food. He could grow his food and store it for lean periods. Population and possession started increasing as more and more food was available and genuine needs could be satisfied. All this meant large negative free energy changes and favourable reaction conditions to make products easily available. The reaction conditions have changed further, during the course of time to make it more facile. For example better crop production has been possible with

the provision of scores of agricultural inputs, use of mechanized farming instead of muscle power, of stored water instead of rain etc. These inputs have given man a tremendous driving force which has enabled him to overcome the negative forces and to assure a better future.

Chapter VI

POLARIZING FORCES AND MIND-BODY SPLIT OR MUNAFAQAT

Intermolecular forces which hold the molecules in their position determine the physics and chemistry of matter. According to present approach there are several interacting constraints on individuals, similar to intermolecular forces on molecules, which determine his behaviour. Some of the analogies which have been drawn earlier between human interaction and physical laws dealt with vapour pressure, fugacity, formation of solution etc. One could add another dimension to these considerations by extending the hypothesis to deviations of ideal society by polarizing forces.

It has been mentioned in the previous pages that materials and societies, being a collection of individual species are characterised by their interspecies and intraspecies behaviour as well as environmental conditions. Different individuals have different interacting constraints so that some are highly polarized while others are passive. A society is composed of a mix of persons, some very ambitious and others introverts. Similarly, a vast majority of substances occurring in nature are solutions or mixtures and not pure compounds. Such, for example, is the case of water which because of the cohesive forces, has the property of being a universal solvent, meaning thereby that it possesses the capability to dissolve or socialize a large number of substances. The analogous interacting constraints on an individual make him a social animal so that he becomes and remains a part of the society.

An ideal society conforming to the requirements of ideal solutions was present at the time of Prophet Mohammad (b.p.u.h.). The impact of the cohesive forces of Islam on the various components of the society was so identical

that it was impossible to distinguish one Sahabi (companion) from the other. The munafiqeen had a dual role to play and would mix with the Sahabis with reservations, obviously because they could not fulfil the condition of uniformity in interacting forces, while another few who did associate with them were carriers of anti-bonding forces which were sometimes highly damaging.

The properties of this ideal society are described by the Holy Quran in surah Al-Fatah asone whose component individuals were kind to one another and united in their stand against the enemy. This is possible only if the positive and negative forces of the society are the same as that of the individuals or if the interactions among themselves promote cohesive forces uniformly. The present hypothesis suggests that maximum activity would be achieved by such a society since fugacity of the individual components would be low. And indeed it is true that none of the Sahabis ever escaped to infidelism after embracing Islam.

In an ideal society it would be hard to distinguish the components from their behaviour, so much so that the results of interaction with their leader would also be the same as that with the other individuals and there would be no distinction among them. The leader, it may be added, initiates the reaction and provides the driving force or motivation energy. As mentioned earlier, the Islamic society during the days of the Prophet was nucleating into and subsequently became an exemplary society. The Prophet (b.p.u.h.) is responsible for having initiated the reaction whereby the infidels embraced Islam and adopted a way of life set by the religion. There was tremendous resistance to adopting the religion and explosive violence in completing reaction such as the following which is usually observed in certain chemical reactions:

Infidels + Teachings of the Prophet --- Religious Society

There are scores of cases in which it seemed impossible for the Prophet (b.p.u.h.) to carry his mission to comple-

tion. One such instance has been described by Anas, according to whom the Prophet said that he underwent the most difficult times and faced situations, the like of which no one was confronted heretofore. According to him, He and Bilal had nothing to eat for 30 days and during those difficult times all that was available could be contained under the armpit of the latter. This event on the one hand shows that Bilal, a slave and the Prophet, the initiator or the leader were facing an identical situation simultaneously and they made no distinction between each other and on the other hand, it demonstrates the attempts of the Quraish to reverse the above reaction by eliminating the initiating forces.

The best example of interaction among individuals to form an ideal society is provided by that between Muhajirs and Ansars. When the Prophet arrived in Medina after Hijrat, he was instrumental in getting the Muhajirs and Ansars into a closer bond of brotherhood. After having been introduced Saad, an Ansar requested Rahman bin Auf, a Muhajir to share whatever was available with him. Since Saad was one of the richest persons in Medina, he offerred his riches, gardens and other elements of his trade. He even proposed to divorce one of his wives whom Rahman would choose to enable him to marry her. Obviously he wanted the latter to shed off the sense of deprivation and feel equal to his Ansar brothers. Abdur Rahman, however, declined all the offers and prayed for his good health and wealth and only asked to show him the way to the bazaar. Immediately after reaching the bazaar he started doing business and had established himself in a short while. This is a demonstration of promotion of equal attractive forces between a Muhajir and Ansar i.e. between species A and B, which is very difficult to obtain, but is the essence of an ideal society.

The Prophet introduced this sense of brotherhood between Muhajirs and Ansars so that they not only shared the sorrow but also the happiness of each other. History is replete with examples to show that cohesiveness of the

ideal society had tremendous impact on those who came in contact with the Muslims. This was because on the one hand it provided a practical demonstration of extreme sacrifices for those who in turn had sacrificed their kith and kin and hearth and home for the cause of religion and on the other hand it provided a neat example of attractive forces among individuals of the community towards the formation of an ideal socity.

Polarization of Societies

The behaviour of Sahabis or companions of the Prophet (b.p.u.h.), as explained above, was quite analogous to that of the components of an ideal solution which by definition is one in which there is complete uniformity of cohesive forces among the solute and solvent molecules. The last condition is obtained if the species in solution are non-polar in character. The intermolecular forces among non-polar molecules are weak and due either to temporary or instantaneous charge separations which enables holding them together and obtaining a shape. The strength of these forces depends on the ease with which the electronic distribution held by nuclear forces can be distorted or polarized.

Polarization is difficult for small molecules since the attraction of nucleus for the electrons is high. On the other hand, large molecules can be easily polarized due to the relatively lower attraction between the electrons and their nuclei. Size of the molecule and the attractive forces between the nuclei and the electrons determine the polarizability of molecules. Applying the principle of polarizability of non-polar molecules to society it may be suggested that a society which got nucleated during the times of the Prophet (b.p.u.h.) was ideal because of (1) complete uniformity of forces among the members, (2) the individual's aspiration could not be polarized and (3) the size of the community was small.

Even during the times of the Prophet (b.p.u.h.) there was a substantial majority of persons who were practising

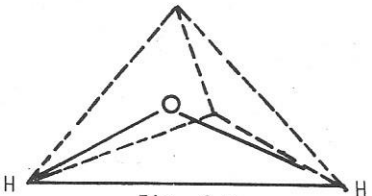


Fig. 6.1

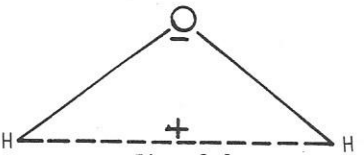


Fig. 6.2

Water molecules with dipoles

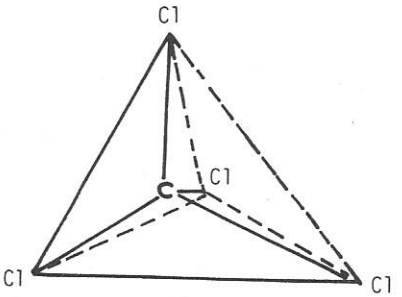


Fig. 6.3 Carbon tetrachloride with no dipoles

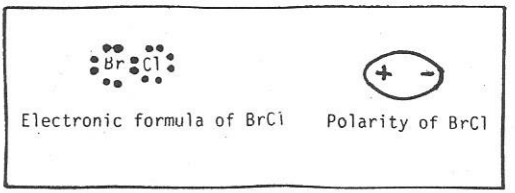
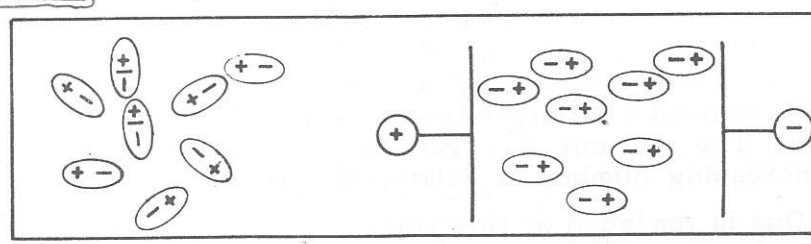


Fig. 6.4 dipole moment = charge x distance

double roles or had a polar character. They would pose themselves as good muslims when they were in the company of the Prophet (b.p.u.h.) and the Sahabis but immediately thereafter they would join hands with the disbelievers and conspirators. Such persons are described in the Holy Quran as Munafiqeen. According to the Holy Prophet (b.p.u.h.), a Munafiq is one who cannot be trusted for his statements, his promises and with securities. Such a person has a very weak interaction with the Muslim brotherhood or as stated earlier, there is only a weak attraction between him and the centre or the nucleus namely the Prophet himself. Such an individual is of course a polarizable entity and hence is a complete departure from ideality. A Munafiq desires to have the best of virtues and evils both by socializing with muslims and their opponents. He would rather like to belong to both the camps and in order to do so he would speak lies, break promises and usurp 'amanats' in complete defiance of the Islamic way of life.



Case of true Muslim

Motivating force not inducing any orientation of poles

Case of Munafiq

Motivating force inducing orientation of poles

A Munafiq could be described as one with a mind-body split. He is unable to practice what he preaches. His deeds and words are contradictory to one another. Alternatively he may be described as one having a polar instead of non-polar character. Polarity of molecules implies separation of charges into +ve and -ve poles. Polar and non-polar molecules are distinugished by their behaviour in an electric

field. The non-polar molecules having no permanent centres of positive and negative charge have little tendency to orient themselves in an electric field. If the lures of worldly affairs are considered as having a motivating force potential, similar to the electric field, the non-polar nature assigned to the Sahabi or a true Muslim would not be affected by it. On the contrary, a munafiq because of his polar nature would easily orient himself to motivating force potential of the wealth and/or evil force thus creating a split between the mind and body.

It may be seen from the figure that mind and body would split easily whenever a munafiq or a polarizable or one who can be easily polarized, is placed in a tempting field. He would be easily induced to commit an act which may be contrary to his thinking and/or his utterances. The motivating force potential is such that the person can change his attitude and adopt an induced position in the field. The said force may be different for different persons, it may be a small amount of cash or jewellery for one, while the same amount may not be effective for the other who might need a stronger field and be induced with several million. The present day rat race is mainly because of the increasing number of polarizables in the society.

14 – One is reminded at this stage of the temptations offered to the Prophet (b.p.u.h.) at the onset of his mission, to give up his tabligh. They offered him gold which could be weighed against his own weight, as much land as he wanted and any of the most beautiful women whom he would name. This is perhaps temptation par excellence which could easily polarize anyone with the strongest mind. The Prophet's reply was obviously, very firmly in the negative. He said that if Quraish place the sun on his right hand and the moon on his left hand, he would not be deterred from his path of Islam. In other words, his motivating potential was higher than the highest.

The Quraish then subjected him and his companions to torture and pressure tactics. The Sahaba were starved

for several days together, were humiliated to the meanest possible level, were thrown on hot sand and dragged over thorns. But even the heaviest pressure could not induce them to get back to infidelity or to a polar state. It may be mentioned here that no one out of those who embraced Islam during these difficult early days of Muslim history ever returned to the infidels. They got depolarized, became God-fearing and believed in the day of judgement when they could be questioned for their misdeeds.

Hazrat Umar Bin Khattab, just before embracing Islam, was very furious at the spread of Islam and wanted to kill the Prophet. However, when informed that his sister and brother-in-law had already embraced Islam, he turned towards their house to deal with them firmly. The sister was reciting the Holy Quran when he came near her house. He was so deeply moved by the verses that he got depolarized and forgot his intention to kill his sister. The depolarising action was supreme as is depicted by the equation stated earlier.

The Prophet's companions got rid of every thing which could polarise them to the mortal riches and founded the ideal society. One of the Sahaba, for instance, had built a beautiful house and thought that the Prophet would like and appreciate its structure. On one of his tabligh rounds the Prophet enquired as to who was the owner of the house. Having known the name he stopped talking to the Sahabi. The latter just could not afford being ignored by the Prophet. When the former came to know that the house was the reason behind his being ignored, he demolished the house. Some days later, the Prophet passed by the demolished house. The Sahabi saw the Prophet thereafter and found him quite pleased. He explained to the Sahabi that it was good that the house was demolishd because these worldly riches have a tendency to detract the attention of believers away from the Sirate Mustaqeem. The Prophet wanted to convert the polar society into non-polar and to have maximum orientation towards the Creator and a firm belief in the Day of Judgement. The palacial buildings

characterising prosperity of the owner are being added to the skyline of urban centres almost every day in clear contravention of the desires of the Prophet. This obviously indicates reversion of the non-polar Islamic society to a polar society namely munafiqeen.

In a world where opportunities are inherently limited and unequally distributed, the stimulii to expand one's aspirations, by comparison with those higher up, are high. This suggests that we live in a highly motivating field wherein polarization is easy and mind-body split is the order of the day. According to Islamic ethics one has to remain non-polar. The Holy Quran has said Allah is with those who are contented. The Holy Prophet has suggested that one should rather look at the have-nots and thank Allah for having bestowed him with the little bit of prosperity, if any, than envy those who have plenty. The latter condition might frustrate him and make him forget being grateful to Allah for His mercy. Thus non-polarity is virtue and polarity is evil.

The Holy Quran makes mention of munafiqeen at several places and has condemned them again and again. By doing so, the emphasis is on obtaining a non-polar society composed of true Muslims like the Sahabis. Their behaviour, being like members of an ideal society, has also been lauded at several places. At the outset, in the first few verses, the Quran says that this Book is for the guidance of those who fear Allah. Such God-fearing persons (members of Ideal Society) are those who believe in "Ghaib", offer Salat, spend in the name of Allah, believe in the present as well as the earlier Books from Him and in the Day of Judgement. Such are the persons who are successful". In the following verses, the Quran describes the munafiqeen as "persons who say that they believe in Allah and in the Day of Judgement although they are not believers at all. They are persons who tell the believers that they are one of them but when they are with the non-believers they say that they are making fools of the believers. Actually they are making fools of themselves".

Scores of evidences recorded in History e.g. Jaffer in Bengal and Sadiq in South India suggest that munafiqeen never looked for brotherhood but for individual gains. The two munafiqeen just named were polarized towards the British and were on their behalf, trying to disrupt the nonpolar forces of Muslim rulers of the Indian territories. The British did succeed in their tactics. When individuals identify themselves from a society, as did the two munafiqeen, polarity is created and there is departure from ideal behaviour.

The Jem affair and the attitude of the Sultan of Turkey in 1460 provide another example of the polarizing phenomena. The latter wished to save his brother who was in prison in Italy and thus wanted to continue ruling Turkey. He therefore sacrificed the cause of the brotherhood rather than his desire. Instead of containing his desires and remaining non-polar as is required by Islamic principles, he was polarized. The result was that the hold of the Ottomans on the far flung areas of their empire became weak. As elaborated earlier, such conditions lead to polarizability in the case of large molecules where there is distortion of the electronic distribution due to large distance from the nucleus. The Kingdom in Spain was thereby completely lost. As was shown in Chapter-II, such a deviation amounts to positive deviation from Rauoult's law in which case there is a resultant higher fugacity and therefore the individual component is discarded by the society. This is the fate of the munafiqeen and that is what has happened to them in the past.

The Muslim rulers of India also do not seem to have been real servants of Islam. They were engaged in identifying themselves as kings and emperors i.e. they were not in a mood to depolarize themselves. They built castles and monuments the architectural beauty of which is unsurpassed to this day. The Taj Mahal is an example of polarization or munafaqat in view of the reaction of the Prophet towards construction of a house by a Sahabi as mentioned above. One, therefore, finds a disturbance in the delicate balance

between individualism and solidarity which should not only be believed and preached but should also be practised. As a result of the said polarization of the rulers towards the worldly riches, the orientation of the society to the indigenous culture was not completely shaken. Muslim domination disturbed it only superficially. The graves in the interior of Sind e.g. those near Nawabshah and at Chokhundi near Karachi carry paintings and/or carvings of animals which are forbidden to be put on by the religion. The people in the past although they buried their dead in the North-South direction in accordance with the religious requirements did want to decorate their dead in the manner which was the dictate of their culture. This shows that the polarity towards indigenous culture had been persistent during the time of their burial. Even the present day graveyards carry 70 to 80% permanent graves which indicates influence of affluence. This again is contrary to the principles of Islam because it forbids making permanent graves.

Culture and religion are synonymous in Islam. Any departure of this principle suggests that munafaqat is taking roots and that there is a mind-body split. This would create moral deterioration which is wrongly being attributed to the failure of religion to act as the cohesive force in uniting conduct and behaviour. On the contrary, this is because the mind-body split has created polarity or two centres instead of one as required by the religion. Whenever there is a split like the one mentioned above, the unity in faith would be disturbed.

In view of the above, the hold of the religion on the living pattern of the people in general and of the middle class and the rich in particular has weakened and munafaqat to the extent of secularism has taken its roots. The two classes just mentioned, are in a highly confused state of mind. Getting money and comfort is success and these two are more important to them than morality and the teachings of the Prophet! Their sense of values has gone down as regards morality.

The effect has possibly been diffused into these persons through what was once known as the downward filtration theory. This theory was proposed by the British as early as 1822 to educate the middle and the higher classes and according to it culture is supposed to spread naturally from the upper classes of the society to the ones lower down. The Government needs only to educate few persons in the upper strata in order to educate the people as a whole. Accordingly it has been thought better and safer to commence by giving a good deal of knowledge to a few than a little to many.

The present hypothesis suggests that if the top of the status pyramid is sufficiently polarised through inspiration/education, the same would be enough to motivate others in the lower strata. This may be found true in other activities also that polarizing forces are first absorbed by those in the higher income group and are diffused later into the society without caring for the destruction of established norms.

stupid

Pakistan is a poor country, having an Islamic and not an open society. The country should go by Islamic principles and not by the dictates of the affluent societies of the West. It should first produce enough before consuming. The Chinese produce the best silk and Indians the best cashew nuts but the two commodities are not consumed by the respective countries; their argument is that they should have enough supplies to have surplus from exports. Pakistanis are proud of consuming every thing foreign, not only the essentials but also the non-essentials. The strong polarizing field of the state media is promoting the consumption. Those who have the receiving sets diffuse the messages to polarize the others and thus whatever is not accepted by the religion is diffused into the society. Munafaqat has thus become a characteristic feature of this society.

Munafaqat or polarity in approach has been perpetuated on the societies of very many countries to such an extent

that it has assumed several forms of corruption in their different strata. The politician, for example makes extravagant promises in his well studded speeches, punctuated by loud applause. This creates a polarizing field since it inducts the audience into believing that the cure of its ills is around the corner. The more ignorant and poor the society, the easier it is to polarize and thus exploit it. The poor needs the basic necessities viz. bread, clothing and shelter and would be easily tempted to follow one who promises him to provide these basic minima. The poor masses already lack uniformity of cohesive forces and have such aspirations of their individuals which can be easily polarized by forceful promises that may not necessarily be fulfilled. They are therefore prone to exploitation by a class of people which can feed on their misery and poverty. Such persons are the real image of munafiqeen; they live in palacial buildings, ride the most recent model of cars, preferably bullet-proof, dine in the best restaurants but preach simple living like that of the Caliphs. Polarity is clearly created between words and deeds, obviously because the leader is unable to translate one into the other. By the downward filtration theory those forming the lower stratum of the society are influenced by the ones in the upper strata. A bunch of munafiqeen at the helm of affairs is therefore likely to create a polar society by practising the opposite of what it preaches.

People in the pseudo-affluent society of developing countries spend several hundred thousands on weddings, decorations, feasts and invite dignitaries who comprise the law enforcing agencies. Such persons obviously demonstrate that they are living beyond their means which is neither allowed by religion nor is it possible if a person is honest in his dealings. Participation of people-who-matter in such receptions only recognises dishonesty and promotes munafaqat. This may be viewed as placement of an insulator or non-conductor or dielectric in an electric field of the type shown in Fig. 6.2, whereby there is separation of positive and negative charges. The separation of charges, called

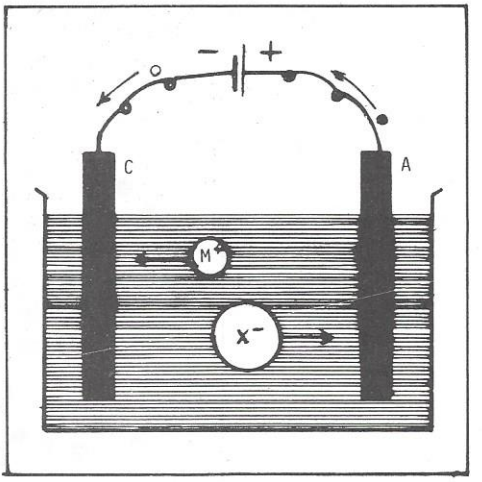


Fig. 6.6 Separation of ions under the influence of an electric field

polarization, can occur by induction or orientation. An electric field always induces poles or polarity whether or not the substance placed therein possesses them to start with. In case the substance has polarity already, the field would align the poles along its own direction and this type of polarization is known as orientation polarization. It is different from induced or distortion polarization caused by the field on a substance which does not have inherent polarity. Polarization can be evoked instantaneously in the direction of the field but in the absence of the latter orientation of polarity is random.

Reverting to the case of the pseudo-affluent society, the munafiq as suggested earlier has polarity inherent in his character when placed in the field of glittering gold and authoritative power, such persons with inherent polarity can easily be polarized and get ocrrupted. They are polarized by orientation and accordingly align themselves with the existing field. Even those who do not have inherent polarity can be inducted to polarization; as stated earlier, some may need a high motivation potential while others may not need as much. This can be summed up by saying

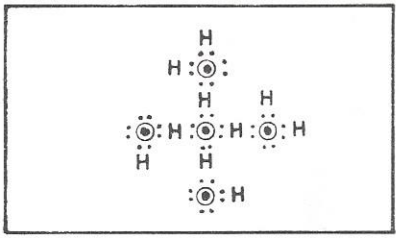


Fig. 6.7 Association of water molecules

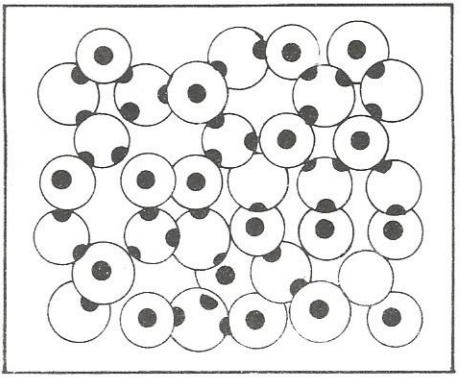


Fig. 6.8 Water structure

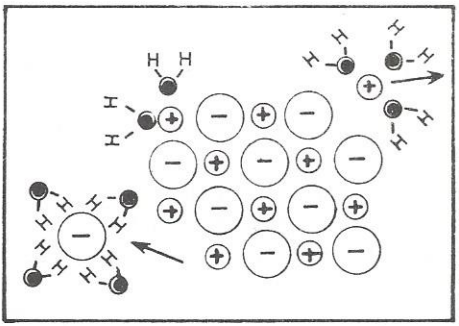


Fig. 6.9 Dissolving of NaCl

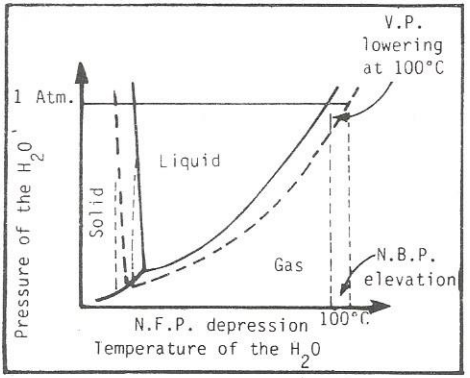


Fig. 6.10 Comparison of phase diagram of water and an aqueous solution (Dashed lines refer to solution)

that every one has a price and can succumb to temptations of the riches and get corrupted.

Another form of polarization appears in the society as large scale smuggling of consumption items, electrical goods, arms, narcotics and other undesirables which honest societies, such as a truly Islamic society, certainly do not need. The smugglers already have inherent polarity and being enveloped by a field of easy money made by evil means, they are able to polarize the persons responsible for their prevention and elimination. Polarization can be evoked easily in the direction dictated by smugglers since the punishment, if any, is ineffective as well as uncertain while the reward is substantial and immediate. The orientation polarization by wealth aligns the culprits and they together have such high motivation potential that they can purchase any one and corrupt as many as they wish.

Estimation of Munafaqat

Water has been mentioned earlier as being a universal solvent owing largely to the high dielectric constant of 80, highest of all solvents. With a high dielectric constant, a solvent can reduce the interionic forces holding the ions firmly in the crystal lattice of the salt. These forces (F) known as Coulomb forces vary directly with the charge on each ion (e^+ or e^-) and inversely with the square of the distance (d) between them.

$$F \propto \frac{e^+ e^-}{d^2}$$

In order to convert this variation into an equation, the constant D, designated as the dielectric constant may be introduced and one gets:

$$F.D = \frac{e^+ e^-}{d^2} \quad \text{or} \quad F = \frac{e^+ e^-}{D.d^2}$$

D, the dielectric constant depends on the nature of the solvent and is a direct measure of the ability of the medium

to reduce the forces of attraction between the ions of the salt. A value of 80 occurring in the denominator shows that the forces are 1/80th for the same average distance apart than in the crystal. The ions are therefore readily detached from the surface of the salt, once they come in contact with water and lead an independent existence in solution with no tendency to form ion pairs.

The forces of interionic attraction in aqueous solutions, though small compared with those in crystals, are nevertheless in existence and interfere in the free movement of the ions. This is because each ion is surrounded by ions of opposite rather than like charge. The ionic atmosphere of opposite charge offers resistance to the free movement of ions. With dilution, the average interionic distance increases and thus reduces the forces of attraction; the ions are, under such conditions, relatively more free to move.

It is possible to estimate munafaqat on the basis of the preceding discussion and equations. Only an estimate is possible because the values of the charges 'e' or of the constant can not be fixed. However, it could be assumed that for permissive societies, like those of the West, and for those prior to the dawn of Islam, the value of munafaqat should be large. The latter could be arbitrarily fixed as a maximum of 100 while for the ideal society described in the earlier part of this chapter, it would be zero. Crystals have been described elsewhere in this presentation as an orderly arrangement and the ideal society was considered as a crystal, with high lattice energy, whose breakdown with the usual solvents is impossible.

An index of munafaqat can accordingly be developed by using arbitrary figures to make up a scale. The components of the scale may comprise the following: whether the individual/society (a) allows/practises difference(s) between words and deeds, (b) makes inappropriate use of power and authority and is corruptible, (c) is untrustworthy with funds and securities, (d) avoids payment of dues,

taxes, levies etc., (e) lives beyond known means of income, (f) offers loans with strings attached and asserts favours done to acceptors, (g) moral integrity is doubtful and invariably tolerates immorality, (h) gets involved in backbiting and evesdropping, (i) practices religion only nominally and (j) is a non-conformist to the norms of society and seeks diversity and polarization. Answers and scores in parenthesis to the above may be sought in terms, never (0), some time (2), most of the time (6) and always (10). Thus a person who responds to 'always' for all the components viz (a) to (g) gets a maximum score of 100 and should be labelled a munafiq of the highest order. A person in an advanced country is by and large not faced with degraded environmental conditions and is contented with the resources and opportunities offerred to him. He may score 2 marks each for (a), (b), (f), (h) and (j), zero for (c), (d) and (e) and six each for (g) and (i) thus making a total of 22.

A society comprising opportunists, profiteers, smugglers should have a high value of D because its score is the highest for each component of the index. Such a society can easily prevail upon the flimsy mind of the illiterates and poor. The latter as a class have a low value of 2 to 5 and hence low polarity. Consequently, they are mere followers of the orders or dictates of those in the upper strata of the society. They constitute 40 to 60% of the population of a developing country. Because of their low polarity they are vulnerable to easy polarization and hence exploitation. If only there was one leader whose words were the same as his deeds, i.e. if he had no polarity or had a zero value on the munafaqat scale, as was the case among the Muslims during the days of the Prophet (b.p. u.h.) and of the Caliphs, the present day polarization could be reversed and a society free of all evils, exploiters and munafiqeen could be obtained.

The high value of 22 assigned to members of the permissive society of the West suggests profound influence on the character of its constituents, for example, the emi-

grants from traditional societies. In order to integrate themselves into the majority society, they have to lose their identity or disturb the framework of their traditional beliefs and norms. The traditional societies of the West e.g. Spain or Portugal may be assigned a munafaqat value of 10 to 14, since they would score from zero to two for (g) and (i) in the index and hence they would have low polarizability. They have significant polarity, higher than those of the poor masses of developing countries, since otherwise they would not seek emigration. Such a value on the said scale enables the migrants from traditional societies to be dissolved or integrated into the polar society by the principle, 'like dissolves like', stated earlier. The orthodox and extremely religious persons from such societies again find it hard to integrate due to their character being non-polar and less vulnerable to breakdown of their lattice arrangement.

In the equation which relates the force F with the constant D, the square of distance between the charges also appears in the denominator implying that it would only be very high values of F which would affect the species at great distances. Polarization is therefore not possible at distant locations. Distances have, however, been reduced by introducing innovations to overcome communication difficulties e.g. through air travel and satellite communications. It is now possible for countries which are at a higher economic level to polarize the opinion of the people of those relatively inferior to them. The radio and TV programmes of advanced countries take advantage of their extended network and polarize at least a significant percentage of population through sports, music, drama and films and in the mean time introduce their version of the events taking place in the developing countries; so much so that this section of population believes their story rather than the facts.

The economic level of the advanced countries has become so high that they polarize the opinion of the people

who matter in any country and can corrupt them. The Arabs have become very rich because of the oil wealth and this has given rise to polarity and to a munafaqat value ranging upto 14 as obtained for traditional societies of Europe. This has polarized them towards the West to such an extent that they have to depend on America and Europe for most of their needs including banking, planning and defence. If only the Arabs were non-polar and had practised Islam in the true spirit, they would have been self-reliant and hence among the most powerful.

Chapter VII

DECLINE OF SOCIETIES AND ENTROPY CHANGES

A system where there are just as many ABs being formed as are dissociated into A and B is given by equation (5.5) which has been used in the earlier chapter to describe a society, lacking a driving force. Such was the condition of the communities in the olden days, at least each time when a prophet was sent by Allah to reform a society. Islam prevailed through the prophets upon the stagnant equilibrium condition and shifted it from one without a driving force to a highly energised society. The specific reaction rate which in chemistry is the amount of matter transformed per unit time per unit volume of the system could also be used for describing the formation of an Islamic society particularly the one founded by Prophet Muhammad (b.p.u.h.). Specific reaction rate for the said society was indeed very high as can be estimated from the tremendous increase in the number of persons accepting the religion and also from the increase in area under the muslim rule which stretched from India to Spain in less than 60 years.

The society remained in an enviable position for over 300 years before cracks appeared. Different factions had since started identifying themselves and were exerting their own influence for power. This is equivalent to the development of dissociative forces, as in equation (5.5), which lead to a society without driving force.

The driving force ΔF of a reaction is composed of

two terms viz. ΔH, the heat of the reaction and $T\Delta S$ the

$$\Delta F = -\Delta H + T\Delta S \ldots\ldots\ldots (7.1)$$

increase in the entropy or randomness times the temperature. The greater the heat generated the larger is the randomness and the larger is the driving force. All spontaneous changes which have a large driving force to their credit also result in large entropy changes or randomness. Thus, it is very difficult to have an ordered state in a heated atmosphere which results in separation of species.

Equation (7.1) suggests that attempts to bring in order in a society would be resisted by a reverse process which tries to establish disorder. Furthermore, like all natural processes the forces creating disorder are dominant. The formation of the Islamic society (an ideal and ordered society) was accompanied by severe resistance to change and a consequent generation of excitement, enthusiasm or heat. A number of persons accepted Islam in the East or West of Arabia more by encapsulation than by total acceptance. The strong current of religion influenced the infidel behaviour for only a temporary period and with the passage of time deviation could be noticed through their clannish attitude. One such example is the paintings and carvings of graves which otherwise should remain plain. The entropy factor in such societies was not low to start with and with the passage of time the randomness started increasing. It is only in a small group that the probability of finding order is high. In larger groups the forces required to bring order have to be well strengthened. The forces just mentioned are cohesive in character and have to be inherent in the system otherwise individuals present in it respond to the natural urge for greater randomness.

This chapter has been divided into two parts, one showing how the driving forces of Islam moulded an infidel society during the life time of the Prophet into an ordered

one. The second part examines the decay of this society in the light of entropy changes just mentioned. A subsequent section applies these principles to the cyclic rise and fall of two societies in Spain and of the Israelis.

The Driving Force of Islam

The Prophet (p.b.u.h.) faced the greatest number of difficulties at the hands of the Quraish who treated the former with the meanest hatred and disgrace that one can imagine but they could not deter him from his right path and from preaching the religion or from completing reaction (5.5) to restore an infidel society. They made several attempts to kill him and once, when the Prophet was offering prayers under the shadow of the Kaba near Maqame-e-Ibrahim, one Aqba bin Abi threw his chathar around the neck of the Prophet and hooked him to fall on the floor. People rushed towards him thinking that he had been killed. However, Abu Bakar appeared at the spot and no damage was done. The Prophet completed his prayers whereafter he addressed those who were trying to kill him. He dared the truth that since God alone was the custodian of his life, their collaboration was all in vain.

The above event is similar to a reaction in which one of the reacting species should be lost in favour of the other, or dissolved into the solvent or majority species due to the driving force of the reaction but being against the will of God it could not go to completion. The event also describes a frantic attempt of the majority to dissolve a non-polar species while the reaction was ultimately to go to completion, that is the majority was to follow the teachings of the Prophet.

In an event Abu Hurera describes that he was very hungry and weak since he had not taken any meals for quite a few days. He was sitting on a roadside so that he could be taken along to the Prophet but no one including Abu Bakar and Omer obliged him. The Prophet then arrived. He would not let anybody down to feel frustrated and

inferior. The ideal society was still being developed and shaped by the Prophet through practical demonstration and so he took Abu Hurera along.

On reaching his place his people brought out a pot of milk. On enquiry the Prophet was informed that the milk had been provided by some people as Hadia or gift. The Prophet accepted it and asked Abu Hurera to call in the people of Suffa. It was customary of the Prophet to send all the Sadqa to the Suffas but would share the Hadia with them. Abu Hurera thought to himself that if he brings in the Suffas, the milk would be shared by a large number of people and since he was the one who would fetch them, he would also be required to serve and consequently there would be nothing for him to drink at the end of service. However, the instruction was from the Prophet and he had to follow the same. Likewise when he brought in the Suffas the Prophet asked him to serve the milk to all those who were there. Abu Hurera did it accordingly and every one drank to his satisfaction and then lastly the Prophet asked Abu Hurera to have the milk. He drank and drank to his satisfaction but the Prophet insisted that Abu Hurera should drink more and this also he did till such time that he had no capacity of taking the milk any more. Then at the end came the turn of the Prophet and he also drank it to his satisfaction.

The above event has been used here as an example to show that the Prophet considered himself just like any other individual of the society and not one above all. His contentment in not asking for a reservation and drinking the milk at the end demonstrated to the society which constituted his kins, Abu Hurera and the people of Suffa that no individual is above any one in the society. He also made it clear that whatever is available should be equitably distributed so that no repulsive forces are generated due to frustration and interaction among all the individuals of the society is established on the basis of brotherhood. Events like these brought order in the society out of total randomness and provided the motivation energy

like communism

for initiation of brotherhood to shape up the ideal society as desired by Islam. They also promoted the development of attractive forces uniformly among the individuals and attracted others to Islam.

The specific reaction rate for the promotion of affinity of the Ansars for the Muhajirs became so high that according to Ibne Abbas when the latter reached Medina, they became the heirs to the wealth of the former instead of the successors of the latter. This, however, was for a temporary period only and was cancelled subsequently through a Quranic order.

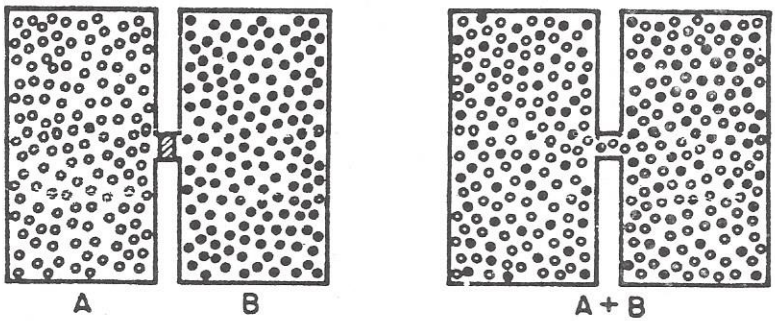


Fig. 7.1 Increase in randomness and entropy on mixing

There are scores of examples of sacrifices by Ansars in order to accommodate and rehabilitate Muhajirs in their society. According to Abu Hurera the Prophet had pleaded that Muhajirs had given up their wealth, family and home and had migrated for the holy cause of Islam. They, accordingly, deserved all the good treatment at the hands of the Ansars and therefore if they sacrifice some of their belongings for the Muhajirs now they will get their return from Allah. Consequently, the Ansars on arrival of Muhajirs offered that the dates gardens may be divided equally between the two of them. The Prophet, however, said that since the Muhajirs did not know how to grow and cultivate dates, it would be appreciated if the Ansars did the cultivation and shared the revenue of the dates. The Ansars readily agreed to the proposal. The Muhajirs,

negative free energy changes or motivation energy and more the value of affinity or brotherhood the farther is the reaction removed from equilibrium towards useful product or formation of an ideal society. This is the physico-chemical explanation for the rapid spread of Islam from India in the East to Spain in the West. The driving force in each battle and each victory was the cohesiveness or brotherhood taught by the religion and demonstrated by Ansars and Muhajirs.

It has been shown in the earlier chapters that in every process whether chemical or physiological an equilibrium is struck between the rate of forward reaction and that of the backward reaction. When the latter dominates there is a reversal in the process. A reversal would produce disorder and restore the primitive societies which would create hatred among kiths and kins. The Prophet had also indicated the reversibility of the gains by saying with reference to the scare by the Muhajirs regarding the credits being acquired by Ansars that the latter would honour and respect them as long as they (Muhajirs) honour and respect them (Ansars) and pray for their health and well-being. This implied that only if brotherhood (cohesiveness) is maintained and honoured, they would be blessed with the driving force.

this is completely re-started

Muslims slowly started having faith in self-attire and in identifying themselves as particular individuals or got themselves dissociated from a collective environment. This constitutes the reverse process of equilibrium as given by equation (5.5) and they started losing their grip on brotherhood. This was exactly the apprehension of the Prophet. One can very well trace from this time onwards that disorder started creeping in and a reversal beset in their attainments and folds. The Muslims as a community got divided. The following pages describe the decay processes by which Muslims lost control of the land which they had ruled for centuries.

Decay of the Muslim Society

The reaction converting infidels through the teachings of the Prophet into a religious society continued with spontaneity and zeal centuries after his death. The Great Caliphs successfully carried over his mission and brought further cohesion among various societies conquered by them setting examples for others to follow. There were attempts aimed at reversal and set back in that the three of the Caliphs were killed but the rate of backward reaction could not dominate or the evil could not suppress the faith and good deeds. The Muslim States had expanded to the extent that all the great highways of international trade were in Muslim hands and the wealth of Muslim kingdom was drawn largely from the profits of commerce. However, a turning point came during the mid-fifteenth century when the Muslims had become extremely proud of their rich and ancient culture and could not believe that their superiority in any field could ever be matched by the European Christians.

In physico-chemical sense a proud society is an isolated system. Since the internal energy of an isolated system is constant, the only method by which it can gain or lose energy would be by interaction with its surroundings. A system would attain equilibrium when it has no tendency to change its properties. At this stage its entropy is maximum and hereafter spontaneous changes cease to occur

Muslim society became an isolated system with a high entropy which constitutes the unavailable energy. A system with large randomness becomes vulnerable to attack and thus the proud Muslim society had to suffer losses. By 1550 the situation had been almost magically transformed. On the East European front, Hungary had fallen in 1528 but Vienna had repulsed a Turkish attack and the Ottoman advance had been halted by the Austrian and Spanish Hapsburgs on the Mediterranian. Christians had reconquered Spain by processes mentioned in a subsequent section and they were trying to establish a stronghold in Africa.

Portugal was building a naval fleet to acquire possession over the states bordering the Indian Ocean or at least to have a share in the trade by sea route. A bitter religious quarrel between Turkey and Persia was at this very time keeping the two Muslim states involved in a show down. The two Muslim states instead of combining their moves i.e. making A+B lead to AB (A=Ottoman and B=Persia AB = Coherent Muslim society) and reduce the randomness to obtain a united force and face the challenges of the Europeans, were trying to identify themselves as separate species i.e. Saffavids and Ottomans and not Muslim brethren which in essence implies dissociative equilibria e.g. equation (5.5). This enhanced the entropy of the system and hence no useful work or a combined attack could be effected to reverse or repulse the moves of the Christians.

Prof. Toynby has correctly assessed the dissociative equilibria prevailing in the Muslim empire and has remarked that the Ottomans might have been able to save Granada and to even stop the Spaniards from discovering America if they had been able to make their power felt in the Western Mediterranian forty years earlier than they did. The Ottomans, however, failed because of their pre-occupation with the Saffavid threat from Persia. They were finally able to contain the latter but they were 40 years too late in taking any action in the West, since Spain had gone beyond Granada and had already gained several cities in North Africa.

The reason for the failure of Ottomans or the predominance of dissociative reaction (5.5) lies in the reversal of equilibrium i.e. dissociative equilibria leading to weakening of the driving force for the forward reaction. The reverse equlibrium i.e. dissociation of relations of two Muslim states was further promoted by Saffavid collaboration with the Portuguese.Events such as the above provided the driving force for the displacement reaction in which Muslims started losing control over Western Europe. The driving force this time was provided by the Crusading zeal of the Spaniards and unanimity of their purpose is shown by the slogan

"Africa for King Ferdinand".

Spain had already taken a few important cities of North Africa. The Barbary Muslims tried to face the situation and at this stage they were reinforced by refugees from Granada. They tried to hit back the Spaniards but the equilibrium could not be restored in favour of the Muslims who then sought the assistance of the Ottoman empire. At this juncture the two brothers Arooj and Khairuddin offered their services and were granted bases on the coast of what are now Algeria and Tunisia. These two brothers attacked Christian shipping and tried to reverse the equilibrium in their favour. With the death of king Ferdinand in 1516 the Spanish driving force weakened in intensity. The people of Algiers took advantage and rebelled. They called in Arooj to bombard the Spanish held fort of Penon which commanded the town and occupied it. Taking advantage of the victory Arooj developed political ambitions. The two brothers started to establish themselves as independent princes in Barbary. Again there was identifying of individuals which implies formation of an isolated system leading to predominantly dissociative equilibria. The driving force for forward reaction weakened and the equilibrium was reversed in favour of the Christians. However, to the good luck of the Muslims, Arooj was killed in 1518 and from this incident the Turkish new-comers realized that they were unpopular with the native Arabs and Berbers. Khairuddin, the surviving brother therefore offered to the citizens of Algiers to appoint any one as their governor since he was prepared to leave. This offer developed high affinity for him and the citizens begged him to stay on. He descended his differences with the Berbers and made a conditional offer which linked his stay with the extension in the rule of the Ottoman emperor to Algeria. The Algerians agreed and later the Ottoman Sultan, Salim confirmed Khairuddin in his position. He gave him military and financial aid required for maintenance and continuation of Ottoman Empire in North Africa. These unplanned but fortuitous interactions extended the Ottoman power to the Western Mediterranian.

This can be rightly ascribed to action taken by Khairuddin in losing his identity by not forming an isolated system and promoting cohesion thus decreasing the entropy of the society and bringing order therein.

The equilibrium with regard to the Spanish attainments was reversed by the strong driving force of Khairuddin Barbarossa who drove the Spaniards from Penon in 1529 and captured Tunis in 1534 thus strengthening the Muslim position in North Africa. The Christian driving force was further weakened by the conflict between emperor Charles V and Francis I of France and further aggravated by an alliance between the Ottomans and French in 1538 wherby Khairuddin helped the French take Nice from the imperialists. The result was that Charles V failed in his attempt to caputre Tunisia in 1535 and Algeria in 1541. The Spanish control of Sicily was, however, a constant threat to Muslims in Barbary and the equilibrium was again reversed in succeeding years.

Decay of Arab Muslim Control over India's Overseas Trade in the 15th Century

The second example showing the decay of Muslim society, as a result of weakening of the driving force for a forward reaction as in equation (5.5) is provided by the Portuguese occupation of the Indian Ocean and cutting off the trade routes which were the monopoly of the Muslims before 1450.

The fall of Constantinople in 1453 was a great blow to the European Christians. They were facing defeat after defeat and with the collapse of the Byzantine Empire the Ottomans seemed invincible. Danube was crossed and Italy had been invaded. The threat to Europe became real, because if Rome fell like Constantinople, the Ottomans could never be halted. The Pope therefore desperately tried to organise a crusade and made a last bid to unite all states to fight the Ottomans. This implies reduction of the entropy of the Christian society to bring in order so that they

could increase the energy of their system and put up a strong fight against the Ottomans.

The Europeans got a breathing space of 40 years. During this period the Ottomans were either self-centred or were occupied in dealing with the Saffavids in Persia and Mamluks in Egypt. The Jem affair and a weak personality of the Sultan held the Ottomans back from following their success at Constantinople. It was natural to see that while the Christian driving force became mighty, that of the Ottomans was weakened. As such the former made a number of preparations to strike at the root of Muslim establishments in trade and commerce. The Spaniards expanded towards North Africa after conquering Granada in 1492 and also towards America. The Portuguese discovered the Cape route to India in 1497-98 and brought the European powers for the first time in history into the Indian Ocean. Foreign ships such as those of the Chinese had been occasionally sighted in these waters in early days of the Ming dynasty (1368-1644). Muslims, otherwise, had a complete monopoly on the trade with India and the Far East. This practical monopoly was destroyed by the arrival of fleet after fleet of armed men from Lisbon who established bases round the shores of the ocean. Arab ships were not sighted and Indian crafts and spices could not reach Egypt or Arabia. The Asian trade was all diverted to Lisbon. These systematic naval attacks of the Portugese followed Le Chatelier's principle stated in the earlier chapter that by increasing pressure the equilibrium can be shifted if there is a decrease in volume as found in the case of ammonia synthesis. The volume of trade as also movement on the sea was contained by the pressure exerted by the Portuguese which reversed the equilibrium in their favour. The volume of trade has been treated here as analogous to the volume of a material like gases for which quantitative treatments are known in physical chemistry.

It may be mentioned here that a state of equilibrium had been reached so far as trade in the Indian Ocean is concerned and this should be the reason for the Muslim

traders and shipowners to be surprised at the landing of Portuguese by the sea route. In fact Muslims had become very proud and did not at all consider the possibility of the ocean route being adopted as an approach to India. All equilibria need an input of energy in order to maintain a rate of forward reaction, otherwise it would be easy to disbalance them. The following account shows that Muslims did not care for this input by taking precautions against possible intrusion because that might mean extra efforts than what is required for trade only.

Muslim ship owners traded with China on the one side and India, Persia and Yemen on the other, while Hindu merchants of the Bania caste belonging to Gujrat and the sea coast of the Deccan and Malabar were mostly engaged in the distribution of trade at the port and were dealing mainly with their own folk. Arabs and Persians traded in the Indian ports of Debal and Goa in their own ships and the immigrants from Gujrat and Deccan made their great annual voyages to Aden and the Red Sea Coast with extensive trade. Foreign muslim merchants lived in large numbers in Goa and other ports. The enterprising Malabari Muslims or the Mapillas mostly controlled the trade and navigation along the western coast of India.

The trade by the Muslims was promoted by the Hindu Kings, and according to Ibne Batuta, the Hindu ruler of Malabar provided wooden houses at regular distances and made arrangements for the comfort of muslim travellers along the great coastal road of two months journey from Sandapur near Goa to Quilon. There were adequate security arrangements and severe penalty to any intervention in trade and hence the roads were quite safe for travel and trade. The Hindu ruler of Calicut extended this type of security to the goods of ship-wrecked merchants also and he made this a flourishing town which drew foreigners in large numbers. There were colonies of Muslims in every city of Malabar where they lived under complete freedom of faith. They had their own mosques and their own Kazi. Undoubtedly therefore muslims were free to trade in the

Indian Ocean and the equilibrium position continued. Muslims were enjoying the trade and business and it appears that the motivation energy in terms of spreading the cause of Islam started lowering down. In order to obtain useful net work, energy has to be put into a system such as this which is a position more like dissociation rather than association. The system, therefore, became vulnerable to envies by the Western Christians.

The Arabs, Egyptians and the Indian Muslims in Gujrat, Calicut and Malabar were taken completely by surprise by the sudden appearance of the Firangs or Franks i.e. the Western Christians. An Arab chronicle composed in Hadramawt has given a description of the Portuguese intrusion. The Infidel Firangs appeared off Mogadeshu and Sabaj in India in 1498-99. They cruised under the wind and arrived at Kilwa where they built a fort. In the year 1500-1 the Mamluk Sultan despatched a mighty fleet to fight the Firangs who had just started plundering muslim shipping in the Indian ocean. In 1502-03 the Firang vessels were spotted enroute to India. This time they engaged themselves in naval action and caputred seven vessels and either killed those aboard or took them as prisoners. The Firangs had become more powerful in 1506-07 and they inflicted heavy losses on the Indian shores. They gained control over the island of Scotra and Hurmuz in 1507-08. At this stage Hussain Kurdi sailed from Jeddah in swift manoeuvering vessels towards Diu to deal with the Firangs who had been plundering in the Indian Ocean and thus had cut the Muslim trade route but he was defeated. In 1508-09 the Firangs took Debal and looted and burnt the city. This was the year when the Firangs made an expedition against Gujrat and attacked Diu. Amir Hussain who was at that time in Diu fought the holy war at sea beyond the port. There was massive killing on both sides but the intruders prevailed over the Muslims. In 1513-14 the Firangs faced their first defeat when they advanced on Aden.

The above account shows the gradual shift in equilibrium from the reverse to the forward and from the forward

to the reverse direction. The Muslims lost control of shipping trade because they identified themselves as individuals which implies making one tribe non-equivalent to the other. The ideal society as shaped by the Prophet did not distinguish between tribes and clans and this brought cohesiveness and driving force for promoting the forward reaction. Muslim merchants trading in the Indian Ocean started enjoying their riches and totally forgot that the associated reactant viz. European Christians were preparing to strike at the international routes. The latter could not do much on land and so they mastered the sea and eventually the sea route provided them success. They had cut the trade with India and the Far East to such an extent that Mamluk Egypt came to an economic collapse and spices and gem stones disappeared from the markets of Arabia. This became possible because the main driving force had been weakened, the entropy of the system had become high and hence the system became susceptible to attack.

The weakening of the driving force came about due to the dissociative equilibria in which the cohesive Muslim society disintegrated into factions like the Ottomans, Mamluks and Saffavids. The last two were collaborating to bring the downfall of the Ottomans which was a superior power. The Saffavids were also collaborating with Portuguese which enabled the latter to establish a stronghold in the Indian ocean.

In conclusion it may be said that associative equilibria promoted the teachings of Islam and the cohesiveness among individuals, clans and tribes spread the religion to lands far beyond the oceans. Then came the dissociative equilibria and Muslims got disintegrated into different factions losing the driving force granted to an ideal society. It is only an ideal society which merits honour and respect and provides an example for others to follow.

On the basis of the analogies presented above it is possible to make a few observations and predictions. The

$$A + B \longrightarrow AB \quad \text{from} \quad A + B \rightleftharpoons AB$$

$$A+B+C+D \longrightarrow ABCD \quad \text{from} \quad A+B+C+D \rightleftharpoons ABCD \ldots\ldots (7.2)$$

Muslim community was powerful as long as equation (7.2) was followed i.e. all the communities merged into one system or society or, to use chemical analogy, a multi-component solution was formed. The equilibrium condition was shifted to the product side and an ideal society resulted in which there was uniform attractive force for each component among its units. A degeneration started when the ingredients identified themselves as individual species. The attractive force among the various components did not remain the same and the cohesion as desired for an ideal society was lost. Dissociative equilibria resulted and the system became suscptible to attack by any powerful species from outside the system. The degeneration was bound to occur because the system did not have a driving force to continue the interaction to the product side and dissociative equilibria were profoundly predominant. The driving force in case of the Muslim community was the teachings of the Prophet. This is what had united the various clans in Arabia and the brotherhood introduced in this manner was adopted by other communities. With the passage of time the clans tried to dissociate. The dissociations were suppressed some time by teachings and some time by force but a tendency did set in to disregard the teachings of the Prophet who for example had said to the Muhajirs that the Ansars would be good to you as long as you are good to them and till such time that you keep praying for their well being. When dissociative equilibria set in, different individuals did not care about others; they cared about themselves. This was a departure from ideality and hence the system was no longer as extensive as desired by the religion.

The situation has worsened with further passage of time. Clannish behaviour is very dominant now among the Muslims and the driving force is no longer the teaching of the Prophet. If it was, there would have been no dichotomy between words and actions, described in the preceding chapter.

The scientific explanation with regard to the various communities constituting the Islamic society trying to identify themselves as separate units is to be found in the analogy with the entropy of mixing of gases. The energy content of a system continues to be the same unless energy is put in or withdrawn from the system since energy can neither be created nor destroyed. Therefore, if a gas is introduced into the system or if it is created as a reaction product therein, the energy expenditure or increase in entropy for mixing would be equivalent to ΔS required for the expansion of the gases from their initial pressure to their partial pressure in the gas mixture:

$$\Delta S = X_1 R \ln \frac{1}{X_1} + X_2 R \ln \frac{1}{X_2} + X_i R \ln \frac{1}{X_i} \quad \ldots\ldots(7.3)$$

$$\Delta S = -R \Sigma X_i R \ln X_i \quad \ldots\ldots(7.4)$$

where $X_1, X_2 \ldots X_i$ are mole fractions of the component and R is the gas constant.

These equations suggest that the larger the number of components, the larger would be the entropy i.e. the randomness in the system would increase since it would be a greater and greater departure from an ordered system. In applying this concept to the society it only needs to emphasize that any person or community trying to identify from the rest of the society would demand an equal share of recognition (expansion to the equivalent partial pressure) which will bring in disorder. Any system which is disordered has a high entropy and low energy, a condition ideal for attack or domination by a foreign body. Equation (7.4) can be used for the case of the societies to show (taking R as an arbitrary constant at the present stage of discussion) that as long as the X_i value i.e. the number of components is low the entropy of their identification is also low and the chances of an order prevailing in the society are maximum. In the cases of increase in the components there would be greater randomness and hence chaos. Since the greatest probability is for obtaining the most random distribution, process of passage of an ordered society into a disordered one is likely to continue unabated.

Cycles of Rise and Fall in Spain

Historical events in Spain present another set of examples where the co-relation established between driving force and entropy on the one hand and decline of societies on the other, are equally valid. Towards the middle of the 4th century, A.D. the region now constituting Spain was the scene of strifes among the Romans and the barbarians including the Visigoths, who after their defeat by the Huns, sought refuge in the Roman empire. They wanted to carve a Visigothic empire out of the Roman provinces.

The area had been over-run by a horde of Vandals, Sueves and Alans by 409 and the Visigoth leader was forced into Spain in 415. The Romans got Spain cleared of barbarians in return for some selfish gains by the Roman emperor Honorius. This constituted an isolated system by earlier definitions which, as a natural consequence, allowed the Kingdom of Tolouse to be established in 419.

The Tolouse kingdom continued under different rulers, the most important being Euric from 466 to 488. He continued the pressure of Visigoths upon Gaul and Spain and by 481 had extended the kingdom from Gibralter to the Loire and Bay of Biscay to the Rhone. He codified Visigothic law. The Gallo-Roman population and the clergy were, however, hostile to this community, being Arians. Their hostility finally resulted in the Frankish conquest in 507 and the Visigoths were contained into Spain.

The Visigoths being a small minority of 20% were romanised not only because of the overwhelming majority of Romans but also because of the conversion of Riccared in 587 from Arianism to Roman orthodoxy. Thus the driving force of the Romans dominated over that of the Visigoths and following equation (5.5) or interactions such as (5.6) on the other, are equally valid Towards the middle of the 4th century, A.D. the region now constituting Spain was the scene of strifes among the Romans and the barbarians including the Visigoths, who after their defeat by the Huns, sought refuge in the Roman empire. They wanted

to carve a Visigothic empire out of the Roman provinces. and (5.7) became vulnerable to assimilation. With the conversion of King Riccared the ethnic immiscibility was overcome but the clergy dominated over monarchy. The jews were forced to accept baptism which they did not accept by heart. Romanization became so dominant that Visigothic speech also gradually disappeared.

The Visigothic kingdom could only drag on with a bare minimum driving force suggesting the domination of disorder creating forces according to equation (7.1). The kingdom was ruled by over twenty rulers from 507 to 711, some of them being mere figure heads. Roderick, the last ruler was proud and cruel. He constituted an isolated system described earlier, and became vulnerable to attack. The kingdom established in 419 had its first rise during Euric's time and a decline due to hostilities of the Romans and clergy in 507. The decline was temporarily arrested by the conversion of Riccared in 587 to roman orthodoxy but new heights could not be attained because of the rise of randomness. The Visigoths had to suffer a total defeat at the hands of Tariq bin Ziad in Wadi Bekka near Rio Barbate in 711.

The conquest of Spain by the Muslim forces and the total elimination of the muslim community from there also follows closely the conclusions of equation (7.1). When Tariq bin Ziad conquered the coastal and southern cities of Spain, he had the sympathies of the jews. He aimed at splitting the christian community, getting a hold on the treasures of Tolouse and annexing territory for the Caliphate at Damuscus. Since he was far more successful in achieving his goals, the Governor of Africa, Musa bin Nusair started doubting his integrity and himself launched an attack a year later from a different direction. The two of them conquered almost all the southern and central territory leaving the northern area ruled by the Fishtalia christians unattacked. Both of them received urgent summons from Damascus and had to abandon their mission to rush back. The conspirators who were successful in getting them recalled were finally able to convince the

Caliph so that the two had to face a death penalty. The Caliph became an isolated system and could not listen to reasons and this became the most important reason for an ultimate reversal of the reaction (7.2). If the initial attack had gone upto the occupation of the North, the said reaction would have gone to completion. However, having left one of the reactants unattacked there always remained a chance to reverse the equilibrium and it took 800 years to expel the muslim community out of Spain.

The first muslims in Spain should have taken full advantage of the driving force which was operational in getting their thrust to the Pyrenees in 719 and in driving the christian remnants to mountains in the north and west. Abdurrehman, Governor of Spain, did take up the offensive and he was able to cross over into southern France in 732 but muslims could not establish their foothold there. They were defeated by Charles Martel and the Franks and by 759 were all expelled. There were 16 Caliphs and eight ministers who ruled over Spain during the 400 years after their occupation but they only worked towards maintaining law and order and rehabilitation of the Berbers, Egyptians, Palestinians etc. Although the christians were granted equal status yet the clergy was actively engaged in surmons inciting the christians to rise against the muslims. Some of the new muslims had not even accepted Islam in the true sense and they included noted persons like Ibne Hafzoon, Banu Hujjaj, Ibne Marwan, Abu Daud and El-Syed who were Munafiqeen of the first order.

The Omayyad dynasty was established in 756 with Abdurrahman, the founder of the Moorish State, as the amir. He was faced with opposition from Arab nobility and support from abroad. His grandson Hakam had to deal with revolts in 805, 814 and 817, while his son had to suppress the uprising of christians and jews in 837. The christian fanatics from within the adjoining states of Leon, Galicia and Naverre continued to pose a threat to the Muslim rulers and they were constantly trying to reverse the establishment of order. This was generating heat and

eroding the free energy input to such an extent that there was no forward reaction and the rulers were only trying to maintain their position.

After the first rise in the cycle obtained by Abdurrahman I in 756-788, the second was attained by Abdurrahman III during 912-961. Newer heights were reached in administration, naval activity, agriculture and industrial development. Cordova became the centre of paper trade, libraries and higher schools of learning in philosophy, mathematics, medicine and translations from Greek. The wars with christian states occupied the attention of each ruler. However, Hakam II also had to deal with the Fatimid dynasty in 973 to replace it with Ommayyad power.

The second decline of Omayyad dynasty started with Hisham II, since power was seized by his minister, Mohammad ibn abi Amir who assumed the title Hajib-al-Mansoor. Although the latter was successful in his campaigns against the christian states and Mauretania and also in checking the religious and racial separatist attitude, yet the latter was so dominant that it became one of the main reasons for the collapse of the dynasty. The end of the kingdom arrived soon after the death of Hajib-al-Mansoor in 1002 when he was succeeded by his son. The latter was able to deal with the christians but his brother Abdurrahman Sanchol forced Hisham to declare him as his heir and this led to a revolt headed by Mohammad, a member of the royal family. Sanchol was executed but the Berbers nominated Sulaiman as Caliph. A civil war broke out and ultimately made Spain a land of petty kingships divided amongst each other and thus easily vulnerable to reconquest by the christians.

The fall of the Omayyads was mainly the result of identification of the self and making it above the Islamic community considerations. The rulers involved themselves in luxuries and in enjoying the temperate climate of the country. They were completey cut off from the people and indulged into totally un-Islamic activities. This was in

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complete disregard of the Prophet's (b.p.u.h) teachings and by all definitions allowed the predominance of dissociative equilibria leading to loss of driving force comprising His teachings, followed by development of positive free energy to make the reverse reaction possible. The Christians were, therefore, able to set the stage for the reconquest of Spain. The events hereafter were all related to further decline and eventual elimination of the muslims from the country.

It may be noted that each time there was an input of energy in the form of a strong will of the ruler, there was a resultant driving force and a consequent suppression of hostility. The fall of the Omayyad Caliphate led to emergence of petty dynasties like the Hammudids of Malaga in 1016 and of Algeciras in 1039, the Abbadids of Sevilla in 1031, the Zayrids of Granada in 1012, the Jahwarids of Cordova in 1031, the Dhul-Nunids of Toledo in 1035, the Amirids of Valencia in 1021 and the Tojibids and Hudids of Sargossa in 1019 and 1031. The Abbadids absorbed most of these dynasties and emerged as a potential threat to the christians, of course after seeking aid from the Almoravids, a Berber dynasty of fanatics founded by Yusuf ibn Tashfin in Africa. The foundation of several dynasties on the ruins of the Omayyad Caliphate bears out the earlier explanation with regard to increase of entropy on mixing of gases as given by equations (7.3) and (7.4). The identification of various dynasties demanded the same amount of recognition as also strength to resist the christian forces. It was obvious that this needed an extra input of energy. On the contrary, the dynasties desired to enjoy luxuries which due to limitation of resources could only be shared. The various kingships demanding a share of resources had to diffuse like the gases to have equivalent partial pressure. Such diffusion only brings in disorder or increases the entropy of the system and an input of energy from whatever source can provide a driving force for a reaction to occur. Thus muslim Spain got another lease of life and the third rise in the cycle, though not of the same order as the second, when the Abbadids

requested the Almoravids in Africa to help them fight Alfonso VI of Castile. Yusuf, the leader of the Almoravids, with support of Seville, provided the needed driving force. He defeated Alfonso in 1086 and annexed Moorish Spain excepting Toledo and Sargossa. His positive action and reforms integrated Spain with the African empire with its centre in Morocco. The death of Yusuf brought disintegration for the empire and Alfonso VI gathered the dormant driving force to attempt a reconquest. He was aided by Rodrigo. Both of them, however, worked for personal prestige. The latter even went over to the Muslim ruler of Sargossa and became ultimately the ruler of Valencia. Such a munafiq working for both sides was regarded as a national hero. After his death Valencia passed on to the Almoravids.

The Almoravids, gradually weakened by the luxuries available and by the temperate climate, could not withstand the pressure of the christians from the north. The Almohadis dynasty had in the meantime become strong in Africa. They invaded and conqurred Moorish Spain in 1144, Morocco in 1146, Algeria in 1152 and Tunis in 1158. Their driving force brought restoration of Muslim unity for the second time in 1172 which marked the fourth rise in the cycle. The driving force of the Almohades was maximum hereafter since they could reduce the Arab influence to nothing in Spain and could defeat Alfonso VIII who was posing a threat to them in 1195. However, a unified attack by Alfonso VIII and Pope Innocent III, and the shrewd role of the clergy, defeated the Almohades in the battle of Las Nevas de Tolosa and the great decline of the Muslims started hereafter. The Almohades lost power and conceded to Ferdinand III a line of fortresses in Africa and a church in Marakash. The Nasrids of Granada could retain some power as vassals. There was some guerilla warfare in Castile and the Moors were not disliked until the 13th century. However, the preaching of crusade, the propaganda of the clergy and the Pope set a stage for the final dismemberment of the Nasrid dynasty in Spain.

The united stand of the heretofore divided christians was responsible for reversing the gains of the muslims but it took them 800 years to do so and for the muslims to experience the decline which the Visigoths did in 300 years. Both of these societies had no driving force of their own and hence both were looking for aid from across the border to sustain their existence in the country. The muslims lost because they were polarized to the riches and not towards the teachings of the Prophet (b.p.u.h.), which should have provided the main driving force. Their entropy factor was high and came down only briefly and at indefinite intervals interspersed throughout their rule.

Cycles of Rise and Fall of the Israelis

In contrast with the previous considerations for the Muslim society, the Jews, although they had to go through the cycle of rise and decline, yet they remained integrated and hence their entropy factor could not become high. Their society underwent two cycles of rise and two of fall before the birth of Christ. The first cycle of rise started with their freedom from Egyptian bondage. Jehovah who was himself worshipped as a god of Sinai led the Israelis into Canaan. He took over their sanctuaries and became god of Canaan and Israel. There were tribal movements and adjustments due to conflicts with Canaanites. The conflict with the Philistinis was particularly forceful towards the end of the 11th century BC and so the Israelites made Saul as their king. He defeated the Philistinis. At this time David, the Prophet, was king of Judah and hence as king of all Israel, he overpowered the Philistinis and conquered Jerusalem to make it his capital. He fought successfully against the main tribes like Moabites, Ammonites and Edomites. The jealousy between Judah and Israel precipitated into the rebellions of Absalom and Sheba.

The rule of Prophet David from 1013 to 973 and of Prophet Solomon from 973 to 933 was the golden era for the Jews because both of them consolidated their position in the region. This was their first rise in the cycle.

Prophet Solomon worked in alliance with the Pharoah of Egypt and King of Tyre. Large building operations were undertaken and the trade extended over land and sea. He invested his gains into further consolidation.

The rise to the attained heights took nearly 300 years. Immediately after the death of Prophet Solomon, the decline also started. The northern tribes were refused tax relief and hence Solomon's son Rehoboam was seceded. There was fight to the extent that the kingdom was divided into Israel and Judah in 933 BC, but Reheboam ruled Judah. The conflict between Israel and Judah continued until 722 BC.

The kingdom of Israel was ruled by two dynasties viz. Omri and Jehu but both of them could not withstand the pressure of Damascus, Judah and Assyria. The Assyrian king Tiglath-pileser III forced the submission of Israel in 732 and on becoming king of Babylon, he consolidated his gains by deporting an entire population of Israelites approximating over 27,000. The kingdom of Israel ceased to exist in 722 BC which led to the first decline of the Jewish society in 200 years. This decline was mainly due to the reversals of the equilibria or lack of input of free energy so that a driving force of the society could not build up. The Israelis in exile comprised the dormant force which was preserved for subsequent use.

The kingdom of Judah created in 933 BC was engaged in fighting with the kings of Israel until the 780's when there was a 40 year period of prosperity. There was an attack from Damascus and king Ahaz in 735 asked for help from Assyria and it passed under Assyrian influence. It was conquered by Pharaoh Necho who was defeated by Nebuchadnezzar in 605 and thus Judah passed under Babylonian rule. Nebuchadnezzar took Jerusalem twice in 597 and 586 and destroyed the city including the Hekel. He took thousands of Jews as captives to Babylon. The kingdom of Judah thus came to an end in 586. In 350 years time, after attaining enviable heights, the Jews had no land to belong to.

The Jews were in relatively better condition while in Babylonian captivity as compared with that in Israel and that is how they could maintain their identity. However, the society completely lost its driving force and equation (7.2) was almost reversed. Such high heat had been generated during the spontaneous process of occupation of Jerusalem and elimination of the kingdom of Judah by Nebucadnezzar that the Jewish society became all random as is expected of spontaneous reactions which invariably have high entropy factor suggested earlier on in this chapter. The reaction (5.5) though reversed, continued dormant.

In 538, Cyrus the great, conquered Babylon and freed the Jews who thus passed under Persian rule. The temple in Jerusalem was rebuilt in 520-516 BC, but the condition of the Jews did not improve. They continued in their period of decline for another 100 years when in 433, Prophet Uzair or Nehemia[6] brought some confidence in the society. He rebuilt the walls of Jerusalem and the temple and enforced the observance of law. They then passed and remained under the rules of Alexander and of the Ptolemies of Egypt from 332 to 198 BC. Thereafter, they remained under the Seleucids from 198 to 168 BC. Jewish society, it would appear, could not get the due driving force and accepted the pressure of the rulers, whoever they were. This suggests that they were a society with a negative

$$\Delta F = F_{product} - F_{reactant} \quad \ldots\ldots(6.4)$$

driving force i.e. in reaction (6.4) the value of ΔF is positive. Such a reaction needs an input of net work to effect the reaction or else it would not take place. It may be seen that in each of the above cases the Jewish society had to be forced to undergo changes otherwise the energy of the reactants, namely the rulers who were invariably other than themselves, was higher than that of the product i.e. of the Jewish society. The rulers therefore provided

must be citing Lewis

the needed energy to maintain this decaying society.

The Jews experienced their second rise in the cycle when they revolted against their ruler Antiochus in 168 BC because he declared Judaism illegal. This was the needed input of energy and it changed the complexion of the society which became so energised that it achieved religious freedom in 164 and political freedom in 142 BC. By these actions the free energy of the society became negative i.e. the reaction was spontaneous and it went for conquests. A rivalry between brothers Aristobulus-II and Hyrcanus-II from 67 to 63 BC meant internal reaction or increase in entropy and consequently reversal of earlier efforts or conquests. Pompey therefore placed the Jews under Roman rule in 63 BC. The decline of the society started immediately thereafter.

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Herod the Great ruled Judea from 37 to 4 BC as king by appointment of the Roman Senate. He rebuilt the temple of Jerusalem and improved other facilities like that of the port. He and his sons ruled Judea, Samaria and Galilee but the later, Herods had only interrupted rule over the territory. Palestine remained under the Romans until 66 AD when the Jews fought a war against Rome and in 70 AD, Titus destroyed Jerusalem. There was another war under Trajan from 115 to 117 AD and a rebellion by the Jews in 132-35 after which Judea was devastated. Jerusalem was made a Roman Colony, barred to the Jews. The centres of Jewish learning were thereafter located in Galilee and Babylon.

The Jews were dispersed into various lands and were not able to procure a home for themselves. Their decline could have continued indefinitely since no input was forthcoming until 1916 when a secret Anglo-French-Russian agreement provided for international administration for Palestine. The Balfour declaration of 1917 stating the British position, favoured the establishment of a national home for Jews. The British armies immediately thereafter occupied Jerusalem. The League of Nations approved the declaration in 1922 but the influx of Jews had since started in 1921

resulting in acquisition of land by Jewish interests and in anti-Jews riots. The British Government provided the much needed input of energy to provide a homeland for the Jews and itself retained military and financial control. There were large scale attacks in 1930 upon the Jews and also an increasing land hunger to make the Arabs landless and unemployed. There were restrictions on Jewish immigration which led to a strike. The clashes including pitched battles continued with the Jews gaining supremacy both in number and weapons. The immigration grew sharply during the second World War. In 1942 the American Zionists demanded both a Jewish state and army and President Truman in 1945 requested the admission of 100,000 Jewish refugees from Europe instead of one million demanded by the American Zionists.

The pressure was mounting on the Arabs whose entropy was rising. They were disorganized and with the loss of the Ottoman Empire they had no position to fall back upon. The British, finding themselves unable to solve the problem, referred it to the United Nations which in 1947 voted for the partition of Palestine into Jewish and Arab land. The State of Israel was proclaimed in 1948. It was recognized by USA and USSR within two days. War started immediately between Israel and Arab League.

The Jews pooled up all the free energy dormant for almost 1800 years. They were aided by the zionists dispersed throughout the world and also by USA and Britain. They acted just like magensium metal which is not reactive due to deposition of a thin film of oxide but when some how ignited it burns with extremely high heat. They struck the Arabs with such superior equipment and driving force that they had to agree to a truce. The driving force kept increasing further and they acquired larger territory and occupied Jerusalem in 1967. After over 1830 years they attained a new height in the cycle of rise and fall. They have proved the point that even if a reaction has a large driving force, it may not necessarily take place. It needs a catalyst to promote the reaction which in this case meant

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the secret Anglo-French-Russian agreement followed by Balfour declaration that brought about the creation of Israel.

The discussion on decline of societies suggests that spontaneous reactions such as creation of the Muslim Empire from Spain to India or of Muslim Spain or of Israel increases the entropy of the system. There is degradation of energy and it becomes less available for useful work. This is similar to the levelling out of temperature or of mountains becoming plains or solids melting to liquids thus increasing the randomness. The process of rise and fall may accordingly be viewed as crystallization of liquid and the

$$\Delta S = S_{liquid} - S_{solid} \quad \ldots\ldots\ldots\ldots\ldots (7.5)$$

crystals subsequently melting into a liquid. The society in disarray is like a liquid while one which is disciplined is similar to crystals as shown in Chapter I; the former society has higher entropy and this is suggested by equation (7.5). The higher the value of ΔS, the higher would be the difference between rise and fall. The internal energy of an isolated system remains constant since energy can neither be created nor destroyed. The Jews when dispersed constituted such a system and so did the Muslims in Spain from 11th to 15th century. Such a system can only gain or lose energy through interaction with the surroundings, which was hostile to the two societies just named. The latter did pick up some energy from the Muslims in Africa and jews did so from Britain and America.

A system at equilibrium has no tendency to change its property and this condition is attained when the entropy has reached its maximum. These conditions were attained during the decline period of the Jews which lasted 1800 years and the Muslims have been facing it for the last 400 years. The values of ΔS for the two societies has been maximum during the said period and that is why their period of decline has been long and wretched.

Chapter VIII

ANTI-BONDING FORCES AND MOTIVATION

Cohesive forces among the components in solution have been correlated in the previous pages with the interaction of individuals in a society and it has been shown that Raoult's and Henry's laws of dilute solutions and LeChatelier's and Guldberg and Waage's principles of chemical equilibria are applicable to human behaviour also. If physical principles such as the ones just mentioned can be related to certain aspects of human behaviour, it should be possible to propose a mechanism of interaction among the human reactants and then try to interpret behaviour in the light of the hypothesis being developed here.

Activated Complex Formation

The rate of a chemical reaction can be described in terms of an activated complex formation. Reactions proceed towards the right hand side in a system at equilibrium with a rate, which is, in simple terms, the number of activated complexes passing per second over the top of the potential energy barrier (Engery of activation in Fig. 8.1) and it equals the concentration of the activated complex multiplied by the velocity with which the complex moves towards the product side. There may be intermediate stages of equilibria, as marked by the overlapping dotted line. It is necessary to mention here that the activated complex is not a state of stable equilibrium since it lies at a maximum and not a minimum of a potential energy diagram. The reaction may be exemplified by equation (8.1):

$$A + B \longrightarrow (AB)^* \longrightarrow \text{product} \quad \ldots\ldots (8.1)$$

The rate of reaction is given by equation (8.2):

$$\text{Rate} = (AB)^* \times (\text{rate of passage over barrier}) \quad \ldots\ldots (8.2)$$

The rate of passage over the barrier is defined as the frequency with which the complex flies apart into products. The complex flies apart when one of its vibrational degrees of freedom becomes a translational degree of freedom. What used to be one of the bonds holding the complex together, now simply becomes the line of the centre between separating fragments. This is the Transition State Theory in Chemical Kinetics.

The concept of a loss of a degree of freedom for the formation of an activated complex during reaction can be explained in terms of the reorganization in structure which occurs in the transition state, thus a planar molecule assumes a pyramidal shape in the transition state.

The activated complex is similar in every respect to a normal stable molecule excepting one difference and that is the loss of one of its vibrational degrees of freedom. This vibrational degree of freedom is transformed into a translational degree along the reaction co-ordinate which leads to the disruption of the complex. Thus instead of $3_n - 6$ vibrational degrees of freedom, a non-linear molecule has $3_n - 7$ while a linear molecule with $3_n - 5$ degrees of freedom has $3_n - 6$ vibrations in the activated complex.

Anti-bonding Energy

The formation of a stable bond between two species depends not so much on the energy of activation as on the energy required to hold the bond from breaking. In other words, it is the energy that is required to overcome anti-bonding. For a reaction to occur the anti-bonding energy must be lower than the bonding energy. The bonding and anti-bonding energy are both equal in the case of the

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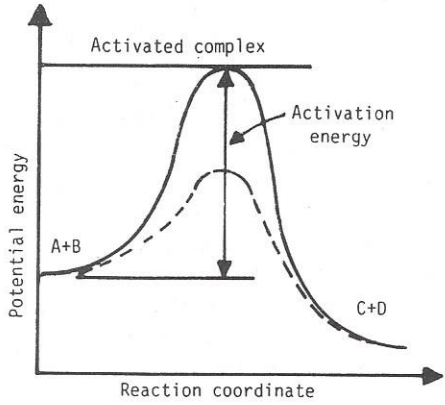

Fig. 8.1 Potential energy change during a reaction (Dashed line refers to catalyzed reaction)

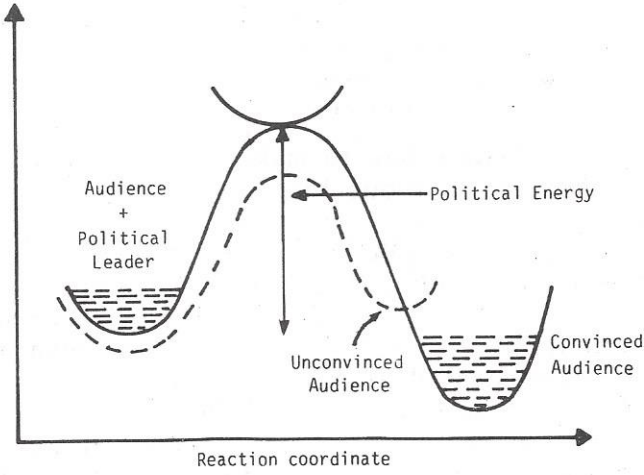

Fig. 8.2 Activated complex of message of leader and audience

so called inert gases like helium and hence there is no stable bond, nor a molecule of such gases is in existence. On the other hand, a stable bond is formed when the anti-bonding energy is lower than the bonding energy.

Focussing our attention now to the interacting forces on an individual in the society, there are indeed situations which can be explained by the above mechanism of bonding and anti-bonding, activated complex and product formation. A person, if he is listening to another, loses or more appropriately, has to lose a degree of freedom and this maximises the chances that the two would align themselves on the same plane. Such a mechanism would permit the communicating person to transmit the message which would be received if the receptor is tuned to the frequency of transmittance. If A is not listening to B, he has not lost the required degree of freedom and hence their interaction may not be possible. The ideas of A and B would only crystallize into one which is fruitful if the activated complex of the two of them flies apart into productive ideas where the bonding energy is greater than the anti-bonding energy. If the anti-bonding energy of the ideas is greater the two of them will be of divergent nature and the persons will not agree with one another.

If a political leader has to make his way through and convince his electorate about his proposals, he will have to make his speech in such a manner that his audience loses a degree of freedom. He may narrate certain incidents, picturise some issues and build up the theme so that those who have gathered are attracted to him. The process of attraction is in itself a loss of a degree of freedom because it initiates the process of alignment of the plane of interaction of ideas. It would be possible for the leader to bring about the desired result from his speech by putting his point across so that the activated complex which his speech forms by interacting with the minds of the audience will result in a stable bond between the two. The stability will also be determined by how much useful political energy is put in to bring about the alignment of ideas because

his convincing the audience requires the crossing of the political energy barrier as in Fig. 8.2. If the speech has been boring, the loss of a degree of freedom in the activated complex would not be achieved and in that case the anti-bonding energy being greater, the audience may not even listen to the speaker.

Motivation

Motivation may also be considered as a process which demands a loss of degree of freedom and likewise requires the crossing of the motivation energy barrier by the activated complex formed between the idea and the one who is being motivated. It is necessary that the person who is motivating must bring about alignment of the ideas of those being motivated, in line with himself, so that when the latter has lost a degree of freedom, the required bond/motivation energy is supplied by the former. The process of motivation involves interaction with one another, formation of an activated complex which results in the right product i.e. a motivated person, provided an appropriate energy for motivation has been made available to the system.

In many organizations it is possible to see this phenomenon working. The workers first listen to the supervisor. They may react favourably and follow his directives or they may react adversely and may not follow his orders. In the first case, the desired results would be obtained and in the second, the anti-bonding forces dominate so that the reaction does not go to completion. In the case of an army, to take another example, the orders have to be followed in the positive direction which means as per the directives. In order to have positive results the army must receive clearly worded communication from the top so that further and onward reaction is not retarded. This is the case of steady state reaction for which the rate is very high and whatever command is received, forms the activated complex which flies apart into action, as desired. If, however, the message is incomplete, the situation

depicted by the dotted line in Fig. 8.3 would be followed where there are humps even prior to reaching the stage of formation of activated complex. These humps are due to metastable complexes which retard the process of communication and slow down the rate of reaction or chain of command.

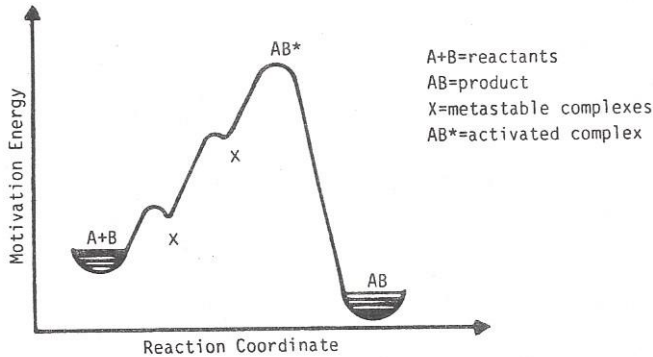

Fig. 8.3 Mechanism of Motivation

Similar interactions take place in community life which comprises a group having common ties, interests and principles that dominate over its entire system like education, housing, health, transportation, industrial prosperity and recreational facilities etc. The ties are a result of a series of positive interactions overcoming anti-bonding forces and forming a stable bond to be established among the components of the society. These developments take place first, through a series of meetings, to decide about the status of the community and then to think in terms of getting closer i.e. bond formation. These meetings gradually reduce the anti-bonding forces which might have existed in not allowing the community to come closer. Finally the energy whether political or motivational, dominates and a peaceful community comes into being. MacIver has described the community and its solidarity in the following lines: "the solidarity of a community depends not on the absence of the differences within it but rather on the absence of

certain barriers to liberation and the consequent modification or adjustment of these differences."

The barriers to liberation are denoted by maxima in the potential energy curves. The crossing of the barriers would be achieved through removal of the anti-bonding forces described by the theory of activated complex formation. If the anti-bonding energy is greater, the modification or adjustment of differences which would be the result of the interaction among the components of the society would not be achieved.

A chemical system is characterised by physical laws which govern interaction among the various components in solution. Each state of solution, viz. liquid, solid or gaseous can be described by the laws of miscibility of components which determine whether the system is stable or not. A community when scrutinized closely may be found to be composed of clusters. It turns out to be a mosaic of minor communities, different in many respects from one another. They are, however, the product of social forces and natural groupings which take shape during the course of time. Like a chemical system a community encompasses a territory. It has common interests, a common pattern of social and economic relations and derives a common bond of solidarity from its living conditions. As a cluster of such people live closely together, they are subject to some degree of group control. The common interest evolved here is a result of re-organization in response to the social control which holds them together and hence the community is an indispensable pre-requisite to personal and group life. It is an extension of the home but with reciprocal exchange of interests and this is how a stable form of community with maximum cohesion is evolved.

The evolution of common interests is a result of adjustment through reciprocal exchange of ideas and interests. In alternative terms, it is the process of attainment of equilibria which are established as a result of interaction. These interactions take place through the formation of an

activated complex and if and when the anti-bonding forces are reduced, the energy barrier is crossed and a useful society comes into being.

The anti-social forces may be described by this model as the domination or prevalence of the anti-bonding forces whereby the rate of forward reaction is slowed down. If these elements dominate in the society, useful work will not be obtained and cohesion in the community may be disturbed. Examples of such disturbances are a matter of common observation in our society. Murders taking place in the community make living in the area very hazardous and people have a larger fugacity in that area due to which any development in the society is retarded.

Leadership

Application of the principles of activated complex formation and anti-bonding forces can be extended to the consideration of leadership since it is directly a motivation process. A leader is one who has the ability to shape the attitude and behaviour of the followers and to convince them first through formation of motivation complex, followed by overcoming the anti-motivation forces. The lower the anti-motivation energy, the easier it would be to form the motivation complex and to hold the bond from breaking i.e. to hold the motivated followers from getting demotivated.

The leadership role is very complex because it has to combine a number of traits to enable the leader to motivate the followers, keep them motivated and to carry his mission to completion. The factors affecting the leadership role could thus be grouped into that of (i) the leader, (ii) the followers and (iii) the mission. These three factors may now be discussed briefly.

A leader is assumed to be a person who can be virtue of the de jure authority vested in him by the formal

organization of the community or by the constraints of the society, influence the activities of his followers and motivate them to direct their efforts into a pre-conceived channel. The followers, however, accept the leadership if they are convinced that the person likely to play the role would deliver the goods and they would be prepared to follow him only so long as he successfully achieves an acceptable level of satisfaction for them. Subordinates follow a leader to achieve their self-interest and if they sense that the desired level of satisfaction is not likely to be achieved, they would accept the leader only temporarily in the hope that conditions would improve in the course of time. In case their tolerance level is reached, the followers may initiate action for the change of leadership. A leader must, therefore, be able to secure a team effort from at least some of his followers. By adopting a democratic approach, he should be able to blend the individual efforts into a group activity.

It is a universal phenomenon that intelligent species work in organised groups. The herds, flocks, crowds, mobs are all conglomerations of one or the other living beings. One individual out of such conglomerations is usually found to possess the capability to shape the attitude of the others in the cluster by sensing the abnormality or likely change in the environment. It takes the initiative either to face the event or escape from the scene. The leader of the flocks of migrating birds, for example, is the first to sense the rise in temperature and is the one which leads the flock. The herd of animals, similarly, has a leader who feels the danger of exposure to the predator and by his action motivates the others to follow. Once in flight the companions follow suit or else they would be left out.

Among human beings the behaviour is better organized. Whenever there are two or more persons working for a mission, one of them has to motivate the others in the group. The one motivated is the follower. There are, thus,

two roles identified at the outset, one by the leader and the other by the follower. The leader is agreed upon by virtue of his being more knowledgeable and more versatile than the others. These qualities enable him to organize group activities better than others. Such a person is in a position to define the objectives of the mission and to set an action plan to achieve the target and hence is the initiator of the reactions leading to group activity. The follower, the other reactant of the group, may accept the line of the leader and start off on the mission as per the instructions which would be an instantaneous reaction; alternatively, they may slightly modify the plan according to their own experience in the field, which is a second order reaction where one or more products, by way of side reaction, are formed. The followers of the first category of persons are completely motivated since by the above definition they lose all the degrees of freedom and may be said to have blind faith. A follower usually has blind faith if he finds the leader not to have failed in any of the earlier missions, and if he has never been found polarized by subjectivity. The supreme leader, namely, prophet Muhammad (p.b.u.h.) is one such leader and this is why his mission gained momentum with time and is successful. The followers of the other kind accept a mission with some reservation and are slightly polarized. If there are too many persons having similar ideas, they might themselves form a leader to create a leader of opposition. This would, therefore, create new leadership and there might be a conflicting situation developed in the society.

The leadership role among the human beings is very complex, because it deals not only with their behaviour but also with the interacting factors such as environmental conditions. According to the discussions in the earlier pages, the leader has to motivate the followers to overcome the forces constituting resistance to change. The higher the resistance to change, the more would be the energy required to motivate. This suggests a lot of insistent

persuasion to overcome the motivation energy barrier. In order that a follower takes the desired action, there has to be an initial formation of a motivation complex, such as, follower-leader-message. If a stable bond is formed in the follower's mind with the leader's message, the mission could be accomplished even if the suggestion is not feasible. Again, for the formation of a stable bond, the forces of anti-motivation have to be overcome. The motivation energy should consequently be larger than the anti-motivation energy. The recent change of leadership in Philippines was the result of formation of motivation complex between the followers of Mrs. Aquino and her message. The anti-motivation forces led by Mr. Marcos, though very strong and alsmost impossible to yield, had to succumb to the pressure of the motivated followers.

The second factor in the leadership role is the follower who is the carrier of the leader's message. He uses his talents for the attainment of the mission of the group or the society or the organization. He joins the group or the organization according to his own career plan or achievement motivation and sets goals for himself so that by contributing his talents, he is able to attain his self-interest and, at the same time, success for the mission. In contributing his talents, he has to interact with the leader to form the motivation complex and follow the plan to the best of his ability. The responsibility for success or failure is that of the leader, if the plan is entirely his, and if the follower has no choice. Mr. Marcos, an aristocrat, had only a weak linkage with the people and the follower-leader complex was only arbitrary. The failure of the plan was imminent and a result of his own doing. The credit is, however, shared if the follower has certain options and if he is allowed to operate freely. The follower would remain a follower if he is not allowed to deviate from the set course. It is only when the follower is allowed to know the details of the problem that he would come up with solutions thus contributing to the mission. In enjoying this freedom, he may be able to enjoy working in the group and would

contribute to the success of the mission.

Mission, the third factor in the leadership role, governs the nature of problems that the society would be faced with in achieving the objectives of the society or the group. It deals with the energy requirements and the requirement of talents for the accomplishment of the task. It may be considered as the message which the leader transmits to the followers. The talented followers decode the message and assimilate it to form the motivation complex thus becoming the torch bearers of the mission.

The three factors are mutually inter-dependent and variable. This implies that they are in a state of flux, but at the same time maintain a dynamic equilibrium with one another. A change of leadership, for example, changes the group as also the relationship among the followers. The addition, replacement or transfer of a follower similarly alters the equilibrium of relationship. The same is also the case when the mission or objectives of the organization are changed.

One could examine the leadership role in the context of the changing pattern of political behaviour in Pakistan. The highest office in Pakistan combines the quality of leadership among the politicians and that of the House. A parliamentary system consists of majority and minority or treasury and opposition benches in the legislature. They have no executive responsibility. The leader of the House has both the executive and legislative responsibilities and in that capacity he is the leader of the country. The first Prime Minister of Pakistan, Mr. Liaquat Ali Khan, was the leader of the majority of the country. He could mobilize opinion of the masses in general and could command respect from all and sundry. The motivation energy was supreme and he could steer the nation out of the difficult times which the country was faced with in the beginning. After his assassination, Khwaja Nazimuddin took over. He was known as a respectable political figure, but was in no

way a replacement to match the personality of Mr. Liaquat Ali Khan? He had a long experience of being the Chief Minister of Bengal but, as he expressed himself, he received the power of the office too late in his life. He was an honest man and had no polarization to subjectivity. He could not suspect those around him of disloyalty until the polarizing forces immediately outside his office replaced him. Then came Mr. Mohammad Ali Bogra? whom the Assembly had to accept as a leader as a gift of the Governor General. Such a person who was deriving his power from the Governor General, obviously had no roots among the masses, which implies that he himself had to invest motivation energy to become popular. This he could not do. The anit-motivation forces were large and, therefore, he had only a loose bond with the democratic institutions.

Ch. Mohammad Ali? succeeded Mr. Mohammad Ali Bogra?, who too had no linkage with politics and again had very little connection with the people. Far better, politically motivated and talented persons were available in the Assembly on the treasury as well as oppositon side and, therefore, he represented a weak group. He at the most belonged to one of the humps in the dotted line of Fig. 8.3 which represents the status-quo. He was the leader of a weak party which formed a coalition Government. His weakness became apparent when there was a break up of the coalition and he was left with only three supporters.

He was succeeded by Mr. H.S. Suhrawardy? who was a very knowledgeable politician and appeared to be the only capable person to lead the country both in the House and the platform. He could motivate persons both in the House as well as outside. However, there were anti-motivation forces which were opposed to a number of decisions taken by Mr. Suhrawardy? The polarizing forces were very dominant in the country in those days and crossing the floor was a common phenomenon. Consequently, Mr. Suhrawardy? had to yield to these adverse forces.

A period of status-quo again followed when Mr. I.I.Chundrigar became the Leader of the House. He again had no roots among the masses and at best he was there by courtesy of those in power. The de-motivation forces were strong and he had to make an exit.

Malik Feroze Khan Noon followed Mr. Chundrigar and although he had his roots in politics, he had no followers either in his party or in the country. Again he commanded no respect from the members of the Parliament and had to be replaced but this time by Martial Law. The country perhaps had a series of experiments with democratic institutions and the people did welcome the imposition of Martial Law, not because they wanted it, but because they were tired of the game which the politicians were playing amongst themselves. The democratic institutions were themselves getting dried up since there were too many leaders and very few knowledgeable followers. Such a situation does not produce any useful product for the country mainly because useful work is not the mission of the leaders. For almost five years the leaders were trying to find followers and the followers did not care to support any of the leaders at that time.

Leadership is a phenomenon which is achieved with great difficulty and there is no short-cut to ascending the highest place in the hierarchy. Any attempt to adopt a short-cut method would mean investment of very little motivation energy and, therefore, the de-motivation forces would bring such a leader down and force an exit. It is only through hard work that leaders can have followers. They must have a mission oriented approach to lead their people to success. Such has not been the case after the death of the Quaid-e-Azam and Quaid-e-Millat and therefore this country has had to face regimentation at the hands of Martial Law.

Marketing

The process of motivation is also involved in the techniques of marketing. The hypothesis being developed here, may well be extended to describe the equilibrium conditions existing between market opportunities and business capabilities. Judicious decisions would shift the process given by equation (8.3) to the right and result in a successful promotion of the sale. In view of these equilibria, marketing should be considered as a process matching market opportunities and business capabilities.

sounds off.?

$$\text{Business capabilities} \rightleftharpoons \text{Market opportunities} \quad \ldots\ldots(8.3)$$

The physico-chemical terminologies may be used to define marketing as a management technique by which resistance to change is substantially reduced in favour of the article being presented for sale. The technique used may be the adoption of a system providing information to the consumer about improvement/development of a better product, guaranteed quality, improved packaging, new prices, sales bargain, after-sales service etc. Such techniques are now adopted with prior research on consumer preferences and buying habits. The latter studies are necessary to introduce new products and to ensure success in sales

Marketing technology is placed at the consumer-product interface. The human behaviour aspect of marketing becomes apparent when one has a close look at the said interface. Techniques of marketing being used these days are such that they can change the opinion and motivate favourably with modest efforts. Every person has a certain preference for a certain brand and there is in some cases severe resistance to change from the preferred to the offered. This is why a substantial reduction in resistance is necessary and hence the above definition.

One of the best tools of marketing is advertising which is a process of learning by repetition. The German

propagandist during World War II used to say "A lie hundred times spoken becomes a truth" and without even analysing the statement, it is possible to see the importance of repetition. Advertising relies on mass media for communicating a message several hundred times, initially at very short intervals, followed by scores of times at slightly longer intervals and then repeating over and again until it is assured that the message has been delivered. This then initiates the process of motivation and the steps involved therein are similar to those described later on learning.

The process of motivation developed in the earlier pages involves the formation of an activated complex between the message and the person receiving it for being motivated. Thus if A is the message about the commodity being offerred and B is the person being motivated, the sales campaign would proceed through the formation of (AB)*, the activated complex as in equation (8.1). The formation of (AB)* would depend on several factors, the chief among them being clarity and credibility. The latter aspect would be discussed subsequently but for the present one would like to know as to why a message has to be communicated several times to ensure its reaching the consumer.

From Fig. 8.4 it may be seen that once the message has reached the consumer a series of processes set in. Some of them are concerned with energising and activation while the others carry the reaction to completion. At this stage the consumer has learnt the advantages in the use of the product being offered and this is the important factor in motivation and in attaining success in sale. It may be mentioned here that sufficient energy, which would be motivation energy in this particular case, must be put in to ensure the formation of an activated complex. The higher the resistance to change from the traditional to the offered product, the more would be the amount of energy required to be put in to motivate. A lot of insistent persuasion would be needed to overcome the resistance or the energy barrier. In terms of communication, the message

needs to be repeated a number of times to overcome the said energy barrier. This according to the present hypothesis is the most important reason why a message is required to be relayed hundreds of times. Motivation energy is needed not only to establish a "lie as a truth" but also a truth as nothing but the truth.

An explanation about motivation energy is necessary and the analogy with chemical reactions would be helpful. The rate of a chemical reaction depends on the number of activated complexes passing per second over the top of the potential energy barrier (energy of activation in Fig. 8.4) and equals the concentration of the activated complex multiplied by the velocity with which the complex moves towards the product side. Coming back to Motivation, the interaction between the idea or message and a person may, in terms of the present analogy, be considered a motivated complex. Accordingly, the extent of motivation would depend on the number of times a message is transmitted. A message is therefore repeated over and over again to ensure forward reaction with the consumer. The height of the energy barrier represents the motivation energy which must be invested to attain success and this would vary from consumer to consumer and product to product because the consumer appeal for the product differs for each individual. Some may be easily motivated while others may be averse to the product. Consumer appeal would be developed when a person is able to see some obvious advantages in the offerred product usage.

There may be situations in which the consumer-message interaction takes place in stages. Such stages may be those of verification and authentication. These intermediate stages of equilibria are marked by the overlapping dotted line in Fig. 8.4. If the person is not satisfied in the first instance, the resistance, as per definition, has not been substantially reduced and he may take some more time at this stage of indecision. Some further input of motivation energy may be needed before such a person is motivated.

The question of clarity and credibility crop up immediately after the formation of even the weakest bond between the message and the consumer. This is the stage of indecision but at the same time it represents semi-preparedness to change. However, if the message is not clear this is the stage to verify. On the contrary, if the message is fallaceous, the activated complex formed initially would break down and get reverted to A and B without obtaining success in introducing the commodity. In case the message is clear in the first instance and also reliable, chances are that it would be accepted.

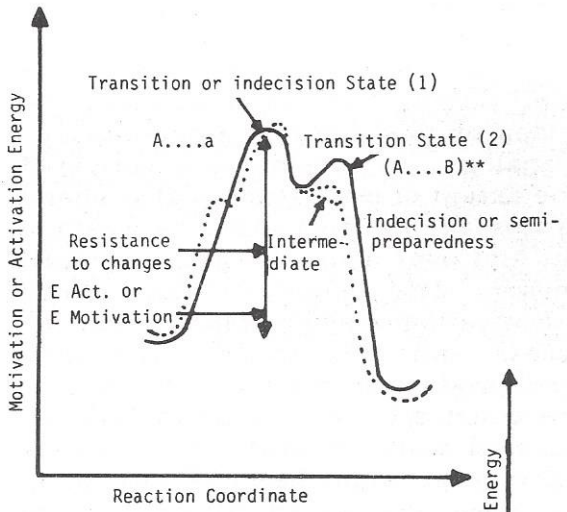

Fig. 8.4 Decision making steps

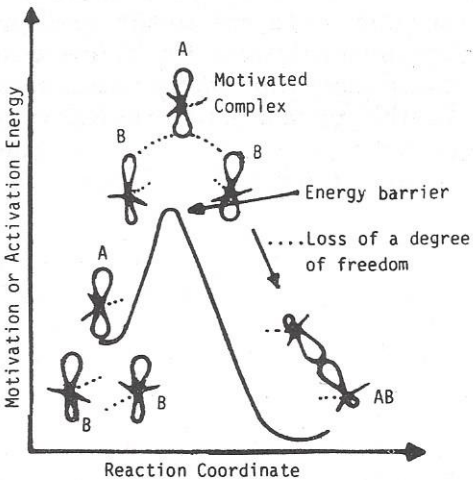

Fig. 8.5 Loss of degree of freedom

The rate of product formation in chemical systems depends on the frequency with which the activated complex flies apart into product. The complex flies apart when one of its vibrational degrees of freedom becomes a translational degree of freedom. In other words, what used to be one of the bonds holding the complex together now simply becomes the line of the centre between separating fragments. This is the vibrational degree along the reaction coordinate which leads to the disruption of the complex in Fig. 8.5 .

The above is an important point for building up the hypothesis. The motivated complex, according to the above discussion is formed when the consumer loses a degree of freedom. A message can only be considered to have been communicated when its recipient has listened to it and in order to do so one has to lose a degree of freedom. The known degrees of freedom can be related to the senses of audition, vision, speech, smell, touch and the sixth sense. One has to lose at least one degree of freedom e.g. speech in order to listen to another person. If the motivation energy is acquired in two or more degrees of freedom, the probability of the activated complex getting the necessary stabilizing energy is enhanced. Consequently, utilizing two degrees of freedom like hearing and sight would be more effective than of hearing alone since the interaction would then be better and there would be greater chances for the message to be received. Accordingly, this is the main reason for the audio-visual communication system to be more effective than the audio or visual systems individually. Thus TV commercials can introduce a new product more effectively than radio commercials alone.

The formation of a stable bond between the message and consumer, designated A and B respectively depends as much on the energy of activation as on the energy required to hold a bond from breaking. This is the energy required to overcome anti-bonding. In order that a reaction should take place the anti-bonding energy should be lower than the bonding energy. According to the present

hypothesis, motivation energy produces a message-consumer complex and to have a positive effect of the message, the message-consumer bond should be kept intact and should be guarded against the forces of anti-motivation. Motivation energy, consequently, should be larger than the anti-motivation energy. The humps indicated with dotted line in Fig. 8.6 indicate that the motivation and anti-motivation energies are balanced and, therefore, there is no stable bond or fruitful result of the message.

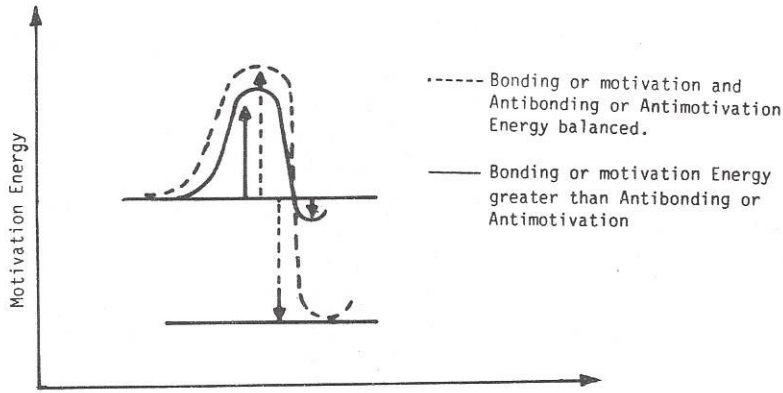

Fig. 8.6 Bonding or Motivation and Antibonding or Antimotivation Energy

Application of this analogy to marketing would indicate that if A does not listen to B the required degrees of freedom have not been lost and hence their interaction is not possible. The sales campaign would only be a success if the motivated message-consumer complex flies apart into productive ideas; but if the motivation energy of the two sets i.e. message and consumer is greater the communicated message would be of divergent nature and the persons to whom the message is addressed would not agree with it. The resistance to change would dominate and the sales campaign would have to resort to better techniques.

It would appear from this discussion that marketing is not just the business capability to exploit market

opportunities but is very much a behaviour process concerned with motivation by learning. Its success depends on the input of motivation energy required to overcome the resistance to change. Motivation energy must be higher than the anti-motivation forces and the consumer must lose a degree of freedom e.g. speech so as to enable hearing, to have a meaningful message-consumer linkage. Human behaviour is thus deeply intermeshed into the equilibrium processes governing business capabilities and marketing opportunities.

Chapter IX

ENVIRONMENTAL ADJUSTMENT

Inner forces in an individual guide his behaviour and these should be the main constituents of the driving force required for any action to proceed to completion, and for the interaction of one with other members of the society. In case the driving force is not strong enough, the forward reaction would be compensated by the backward reaction, and consequently the behaviour of the individual would suffer from frustration and conflicts. In order to proceed forward, the components of the environment interact with one another to achieve equilibrium and to adjust. The mode of their adjustment is again guided by the driving force which can be designated as the force of motivation in an individual.

Living beings are all made up of organic tissues and their biological, physiological and biochemical needs have to be fulfilled for conservation, maintenance and survival of the species. These are the tissue needs. The tissues are conserved only if the necessary amount of energy is supplied to them. There are different sources of energy and the tissues obtain the latter from food, water, air, sunshine; in other words, everything in the immediate environment of the organism is the source of its energy requirement. The next is the maintenance of the living tissues. The tissues are made up of cells and these cells are covered and surrounded by aqueous fluids which are produced by the body.

These fluids are constantly replenished once the same are consumed by the body for the performance of the different functions. This is the preservation mechanism of an organism. The living bodies breathe oxygen and this

function initiates a series of biochemical reactions in the body. Its different functions, for example, the metabolic processes which result in the production of body wastes and carbon dioxide, are carried out through the gain or release of energy during these reactions.

The biochemical processes are the result of interaction of the biological species with the environment with which they have to adjust. This adjustment takes place strictly in accordance with Le Chatelier's principle mentioned earlier, in order to maintain equilibrium and also a forward rate of reaction, otherwise the reverse reactions will set in which may decay the tissues. The maintenance of equilibrium has been described by Cannon as "homeostasis".

The way adjustments take place in terms of the tissue needs can be shown as originating from the driving force of the need to maintain itself so as to survive in the challenging environment. It is challenging because appropriate supply of food may not be forthcoming; the food supply may at times, be depleted. Water may become scarce or safe water may not be available. Air may be polluted with noxious fumes. The temperature outside may be too high or too low. The body adjusts to all these challenges when faced with them. In the meantime, human being has learnt to defend itself from the extreme variations in the natural variables like the availability of food and water and some of these needs are fulfilled through group co-operation.

It is the body adjustment which is the matter of concern here. The body requirements are adjusted like chemical reactions. For example, if the reaction requires an input of heat, only heating and continuous heating will keep the reaction going. If the thermal energy input is stopped, the reaction would also cease or would at least be slowed down. It is like the intake of food, if it is postponed there would be a slowing down of activities and the body would need food more than anything else in order to return to the normal activity. Thus the needs of the tissues are almost the same as those of the chemical reaction.

It is a matter of day to day observation that our tissue needs are greater than most of the others. It must be so because their proper function is related to the potential of the energy supply, driving force and ultimately to the actual working of the body. The energy supply may be muscular or nervous. In any case, constant supply of appropriate energy is able to stop the backward reaction i.e. the reversal of equilibrium. Hunger and thirst are some such disturbances of the equilibrium processes. They are exhibited by the contraction of stomach muscles and the drying of the throat. The source of energy would be food and this will provide the necessary driving force.

In other biological functions it is the maintenance of the constant physiological requirement which determines the intensity of the driving force. The organism controls its behaviour by its strong tendency to maintain the equilibrium.

Human nature has been defined as the psychological activity set up in such a manner as to gain pleasure and avoid pain. The old theory that pleasureable is what is good, painful is what is bad, would in the present context be interpreted as the positive driving force which leads to completion of reaction, to satisfaction or pleasure while the backward reaction, if favoured, produces a disturbance of equilibrium and hence is painful. The disturbing or inactivation or deactivation process sets the adjustment mechanism into operation. The negative activity is restrained and the pain and discomfort are suppressed. It may therefore be generalised that the positive driving force is generated when the process of reverse or backward reaction has been suppressed or has been overcome. Drive has, therefore, been defined here as the activity to remove the pain or stress and the same has been assumed heretofore as being responsible for all human behaviour.

The above hypothesis that the driving force in an individual is the basis for the removal of stress, so that the equilibrium in the forward direction is maintained, is

further supported by the tendency in certain persons to seek pain and misfortune. This tendency is known in psychology as Masochism which in the present case is the tendency for reversal of equilibrium. It may be pointed out here that this is not an exception as may be true of other theories. On the contrary, this is a general case whereby the drive is aimed at perpetuation of pain or discomfort. Here it is the negative driving force which removes the stress and brings pleasure.

Some of the observations regarding the persistence of the driving force can obviously be explained as being due to the presence of the latent forces. In the present context where drive is being quantified as the driving force, it might be possible to measure it in terms of the observed behaviour. For example, it may be observed as fantasy or in the form of tension. In such cases the drive may be dormant for many years and may appear in active form at the generation of a particular stimulus. Earlier experiences which might have been dormant may strongly arouse the emotions in some particular environmental conditions.

It has been mentioned earlier that reactions between hydrogen and oxygen may not take place unless a catalyst is present. Other reactions may be arrested either by cooling down or lowering the pressure of the system. Residual tension may persist either through supression of activity, reversal of equilibria or by inhibition of the reaction. The amount of suppression of the need can be measured in terms of frequency and intensity of the relapse of the desire or demand. It was shown earlier that if a reaction has to occur it should proceed through activated complex formation by splitting off after passing over the potential energy barrier. Therefore, if the reaction is dormant it needs energy to cross the barrier. This crossing of the barrier will push the equilibrium towards the right hand side and thus satisfy the need. The more frequently it passess over, the earlier will be the satisfaction of need. The ease in satisfaction will depend on the frequency

and intensity of expression and if these two are known the need can be estimated. If the need is satisfied by spending measureable quantities of commodity then it is a material need but if spending of energy, whether political or persuation, brings about the result then the correlation of the demand or need with the strength of the drive may be effected only in relative terms.

There may be many needs which might be expressed or suppressed or might need recognition. Similarly, there might be cases where a need strongly remains unsatisfied and may not even be recognised. It may have been observed that hunger is the strongest need and all others follow it. On this basis the human needs have been classified by Maslow who has established a hierarchy of needs and he suggests that the needs are critical in influencing behaviour.

Several drives may be combined to produce a certain act. This will complicate the understanding of the motivating forces for the combined behaviour. According to Maslow, a person may be working for 'self', security and to fulfil his physiological needs at the same time. The concurrent needs when sorted out may be classified as innate and acquired. The innate needs may be physiological i.e. those requiring food, water, shelter, air and preservation, form the base line of hierarchy of needs while the acquired ones may be either the social or egoistic. The social needs may be companionship, want of love and affection, sense of belonging, self-esteem and self-respect, safety and security take a position above the base line. Egoistic needs are self-recognition, accomplishment, acquiring position and acquiring independence and they are at the top in the hierarchy of needs whose general picture is as follows:

i) Self actualization, authority
ii) Recognition
iii) Social affiliation
iv) Safety and security
v) Physiological needs

drive-the paradox issue

According to the concept of activated complex formation and the free energy requirement to drive the equilibrium reaction to completion, the fulfilment of human needs depends on overcoming the anti-bonding forces. It is not possible to say with precision that the needs noted above occur with consecutive or successive equilibria. On the other hand, they might constitute a series of equilibria marked by kinks as in Fig.9.1, which may or may not occur simultaneously. It is a common observation that the physical and emotional needs are rather intermeshed with one another. Hence, it does not appear necessary that an individual would first satisfy the basic needs and then go about fulfilment of his highly social and egoistic needs.

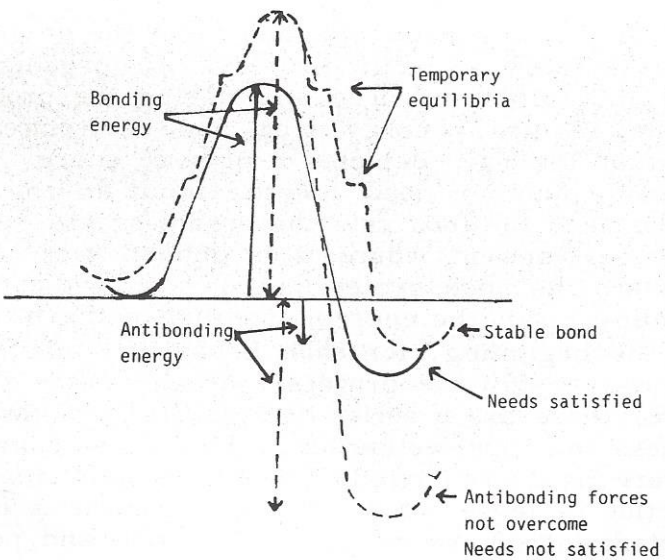

Fig. 9.1 Satisfaction of Needs

The acquired needs may be real and also intense. One tries to satisfy the innate as well as the acquired needs. What is mainly required is their satisfaction; implying an actual shift of equilibria to obtain useful work. This

aspect has to be kept in mind in order to study human behaviour and particularly so in the case of the employees in an organization.

The drive or motivating force as discussed so far is called for to satisfy the need of an organism. For a particular activity the drive is said to initiate a stimulus into the reflex system and this triggers the reaction. The drive becomes dynamic only when there is a chance for collaboration with the exterior stimulus. Human behaviour is therefore, a combined interaction of (1) the internal forces set into action or stimulated by the need and (2) the reaction stimulated by the situation in the environment with which an organism is interacting. The energy needed for the completion of interaction, in order to obtain the desired result, is usually obtained from the environment. This constitutes a cyclic process. An organism seeks pleasure and fulfils the need and during the processes it seeks the required energy from the environment. The fulfilment of the need depletes it of some energy which in turn creates another need for the input in the form of food. The need for food sets the organism into interaction with the environment where it is obliged each time it is approached. The whole process is then composed of depletion and building up of the energy potential in the body.

In the beginning, for each behaviour, whether it is towards day-to-day life processes or any other fulfilment of desire, there are a series of random interactions. This randomness and imperfection has to be reduced considerably so that errors are minimized. The knowledge of the process of reduction of these errors is what is known as learning. The curtailment of errors, its rectification and perfection are some of the processes which one can see in the growth of a child from infancy to adulthood. During infancy there are a lot of errors and the children learn through their mistakes. The drive to get past the errors is there and hence the rectification process keeps working all the time. If the drive has to face a lot of rectification the person would be faced with conflicts. If the conflicts are gracefully overcome, one is blessed with success.

From the equilibrium point of view, energy is needed for the infant to get past the errors and mark out a series of reversible equilibrium processes. If the equilibrium is reversed an error is committed, if not, the energy barrier is crossed, the anti-bonding energy is overcome and the error is rectified. From infancy to childhood and onwards to adulthood, the success in life is attained by crossing an energy barrier each time one is challenged by an obstacle. This latter process acquaints the organism with the process of living in a particular environment. Again, the interaction process demands that the organism should orientate itself towards the forces of the environment and for this purpose it has to lose a degree of freedom each time. If he keeps losing the desired degree of freedom, he will be receptive to the particular item which is transmitted to him by the environment; otherwise he is likely to commit an error. But once he has received the message in the right manner, the equilibrium is shifted towards the direction of fulfilment of the need. He would have then accomplished learning, i.e. would have received the message.

If the same reaction is performed again and again and if the results can be reproduced successfully, the person doing so has acquired skill and he can be considered independent of further guidance in the particular field. The series of equilibria that constitute learning make the organism learn how to reduce the number of errors and the steps for achieving the objective viz. the fulfilment of the need. This is the Law of Effect put forward by Thorndike. According to the present hypothesis drive leads to the crossing of energy barrier for each series of equilibria and the process is complete when the anti-bonding energy has been lowered.

Adoption of a certain attitude and behaviour may be seen to occur by a similar process. It is usual that after having learnt how to reproduce a certain phenomenon one is likely to look for the same set of surroundings, in order to be predictable in behaviour, more often since

one would not like to report failure when called upon to undertake an action. It is the insecurity regarding predictability in another environment that one resists a change for another environment particularly for one reason that in the new environment the person may have to readjust. The series of interactions which were marked by indicators in the familiar environment may or may not exist in the new one. Children or more generally the off-springs, if not all the organisms, are accordingly frustrated and resist a change.

In chemical equilibria also such situations arise when a reaction is not reproducible. It happens for some reason that the yield of a product from the same reaction varies from person to person. But the same person can, after a series of repetitions, reproduce the yield. The variation of the yield is not only because of the change of personnel but also in the change of the appropriate reaction conditions. One controls conditions of reactions e.g. those which are spontaneous are slowed down by cooling. These small techniques that one learns through experience count in making a reaction a success, otherwise the series of reversible equilibria involved in a particular reaction can be dominant and may not yield the right product at all. This is analogous to the anomalous behaviour of an organism in a situation where a particular set of conditions, which it is used to, are not obtained.

Adjustment

A living being or more generally an organism is influenced by the environment comprising interacting forces which may be physical, social or oriented from the 'self'. Natural surroundings and matter in the immediate vicinity influence the living, maintenance and survival of the organism. One has to work as well as conform to the laws of nature and of the society besides facing the challenges of the environment in order to survive. A group of individuals interacting with one another forms a society. They conform to certain norms posed to them so that living

is agreeable to all concerned. The social as well as physical environment pose external influence while the 'Self' regulates the person himself.

Differences in the living environment profoundly affect physiological conditions. Thus persons living in the advanced countries enjoy better climate compared with those living in the developing countries which fall mostly in the tropics. As far back as 1842, Mayer, who was travelling in a ship as the ship's doctor, had observed that the brightness of red colour of the blood of persons living in the tropical countries was much more than those in the temperate zone. The local physicians in the developing countries at that time explained to him that it was due to the lower consumption of oxygen required to maintain the body temperature. This was the initial observation which led to the formulation of the first law of thermodynamics.

Mayer started thinking that if the oxidation of nutrients could give rise to body temperature, it should be possible to produce work from the warmth of the body. The same quantity of food, it was agreed may some times give lower and at other times higher temperatures. Since the body conditions depend on different quantities of heat which would be produced under varying environmental conditions like humidity, temperature, atmospheric pressure, etc. and since the amount of oxygen consumed would in each case depend on the foregoing factors, an adjustment mechanism will always have to regulate the output of heat to conform to the requirement of the body. A person living in severe conditions of heat or cold, rain or drought, greenery or aridity would always make a different living for adjustment and in each case the requirement of oxygen would be different. Those living in temperate climatic conditions where it is neither so hot nor so cold, where the severity of humidity or heat is lacking, would enjoy better living compared with the rest because among other things, the normal physiological conditions are obtained under less severe conditions. Adjustment in temperate zones of the world is therefore

much easier so far as the body requirement is concerned. As seen in Chapter VII, this was one of the main attractions for the Muslim rulers of Spain.

Adjustment becomes a problem for those living in the tropics. Consequently certain characteristic features in the living conditions of the communities are likely to be created in such zones. They would for example be easily excited and in an excited state they are likely to deviate from the normal course. This is just like the reaction between lime and sodium carbonate where the resulting product is calcium carbonate. The latter is precipitated in the form of very fine particles as light calcium carbonate if the medium or the environment of the reaction is cold but the same particles are coarse grained if the environment is above 25°C. The environmental conditions have played an infinite role in the past in the shaping of the earth and its surroundings. Human beings are only a part of the biosphere and therefore the living conditions are different under different environmental conditions.

The social environment is built up through the interaction of a group of persons with constraints imposed by the physical and natural surroundings. Conforming to a situation implies that persons concerned would get adapted to the conditions of living in a neighbourhood and realize the importance of maintaining the desired relationship with the environment. The relationship of course, would be established through a series of mutual exchanges which proceed by following the laws of nature and of the environment and by adherence to the impositions of the society. The 'self' is expected to conform to the norms of the society in order to maintain a satisfactory relationship with the social environment. Since it is necessary to maintain the 'self', the society, and its species, there has to be an individual as well as collective response to the challenges posed by the environment so that the system survives. During the responding process the individual or the group may mould itself in such a way as to belong to the environment. The environment, therefore, shapes the

individual. In order to get shaped the individual adjusts himself to the environment.

The process of adjustment, is also governed by the LeChatelier's principle, stated earlier, which requires that the individual should remove the stress i.e. he should satisfy his needs otherwise it will lead to frustration and this he must avoid, because any reaction to frustration is aggressive behaviour. The situation where such a behaviour may call for punishment, which when anticipated by the frustrated, may create a distressing condition in him. This situation is anxiety. These are some backward reactions or reversals of equilibria. An individual always reacts to agressive situations and in order to maintain the equilibrium, builds up strong defences against distresses. The methods employed are modes of behaviour required under particular circumstances in order to bring about adjustments.

Adjustment is facilitated by the experiences of an individual during his lifetime i.e. in the process of rising from infancy to adulthood and then onwards he learns through past observations. The more he observes, the more experienced he is and the broader is his background. Persons who have travelled widely are said to be very experienced since they come across situations of different kinds during their travel and have seen for themselves how the individual, the self or the society react to different situations and respond to challenges. Such a person can act as a counsellor who can advise his less experienced colleagues as to how and when to face the distress. Most of his decisions are based on his own earlier experience on adjustments which he has had to make under similar environmental conditions. These adjustments are in accordance with the principles stated above and take place in order to remove the stress and maintain the series of equilibria that are so vital for his existence. The individual seeking the counselling may through the words of wisdom be placed in a better position to respond to the challenges and his strategies could be planned accordingly.

The adjustments may be made by moulding the environment, in other words dictating the circumstances and thus manipulating the desired and/or preconceived conditions. The fulfilment of need in this case would be through overcoming the stresses of the environment. An individual fights against odds and makes the situations to adjust to his will. This is shaping the environment but for doing so he first evaluates the quality and quantity of stresses one is likely to face in this connection. The British for example, did not just conquer the Indian sub-continent by waging a war against its rulers. They first established trading centres through their emissaries, who sensed the situation, explored the land and only when they had obtained the relevant strategic information, that the attack was made. Whether it was Bengal or Sind, the British gained a long range stability by this approach. They could then dictate the environment to adjust according to their need. From this it may be inferred that in order to rule a society one has to quantify the stresses in the environment, study the nature of the individuals or the organisms on which the interaction is supposed to take place and plan strategies for attack so that the reaction proceeds without resistance and shifts the equilibrium in favour of the one who is initiating the reaction. This process leads to adjustment and to shaping of the environment.

The other type of adjustment would be to conform to the environment. Here it demands conformity with the dictates particularly those of a pressurised condition. Here the individual has to modify his needs and also not to counteract frustration. Adjustment should not be achieved by submitting to the dictates of the environment, otherwise the identity of the individual would be lost. On the other hand, the interaction has to occur in such a manner that the processes of maintenance of identity and of interaction with the environment are well-balanced i.e. the equilibrium between the identity of the self and the cultural or social environment is maintained. The latter needs continuity and the individual decides to conform to obtain social survival.

Persons conforming to social norms are considered normal while those who are eccentric, queer or deviated, are supposed to be poorly adjusted and are considered abnormal.

Refugees or emigrants to a foreign land usually have problems of adjustment. They would like to maintain their identity even though living in a foreign land it may be hard for them to adjust readily in a strange environment. However, it is the group opinion which counts because the people in the immediate environment and the one who matter in this connection exert considerable pressure on such an individual to conform to their way of living and their habits. The Pakistanis migrating to England, for example, are faced with just this problem and there is serious criticism on their way of living. In other words, pressure is being exerted on them to conform to the British way of life. On the other hand, the Pakistanis being not insignificant in number, resist conformity. This gives rise to conflicts e.g. the one which occurred in early September 1985 in the city of Birmingham.

Some of the non-conformists who challenge the environment, turn out to be innovators. People, however, do not appreciate their efforts and look down upon such individuals. If there are too many non-conformists, on the other hand, it becomes a revolutionary society, which suggests that there is quite a bit of randomization and too many stresses and strains on the structure of the society. Randomization occurs when the degrees of freedom are maximized. The non-conformists would like to enjoy greater degree of freedom and are not prepared to listen i.e. to lose any of it. Instead of a reversible equilibrium, there is an unstable equilibrium. But, by the very laws of nature, unstability is not tolerated. The society, therefore reacts to the non-conformists in order to maintain a healthy environment. It will ultimately depend on the nature of the driving force whether the non-conformist will dominate the society or he will be dominated. The Prophets were non-conformists and the positive forces of some of

them prevailed upon the society. However, most of them, in spite of a positive influence on their society, could not force the equilibrium to the formation of the desired social environment. Similarly, Galileo and Copernicus were also non-conformists but they were prevailed upon by the negative forces of the society and the equilibrium was pushed back to the left hand side and their efforts did not bear fruit during their life time.

Frustration

The process of adjustment determines behaviour. In qualitative terms it describes as to how satisfactorily an organism adjusts itself with respect to the environment. It is difficult to describe the process quantitatively but an attempt can be made to offer a model so that quantification is possible. Issues generated by the above definition are process and adjustment. While equilibrium processes in physico-chemical terms are described by Le Chatelier's principle stated earlier, all actions and reactions taking place in nature are processes which always follow the laws of equilibrium. Accordingly, adjustment is also a process for the removal of stresses on an organism.

Man has a greater capacity to learn and modify his behaviour but this quality necessarily leads to his being inconsistent and to run into conflicts. This does not in any way contradict Le Chatellier's principle, but only points out that inconsistency in behaviour is one of the major problems in adjustment and these are created by obstacles. The more the obstacles, the more will be the inconsistencies and the more would the equilibrium process be delayed. The major process would be divided into a series of equilibrium processes ultimately leading to the final adjustment.

Behaviour in other words, is evoked by the pressure of needs which every organism develops. Needs are satisfied by interaction with environment. Adjustment is attained in a friendly environment because one has to face only a few obstacles. Such a situation is, for instance, attained for an

Englishman arriving in Canada or Australia. On the contrary, needs are not easily satisfied in an unfriendly environment. This creates a frustrating situation and here the adjustment process would involve overcoming barriers of frustration.

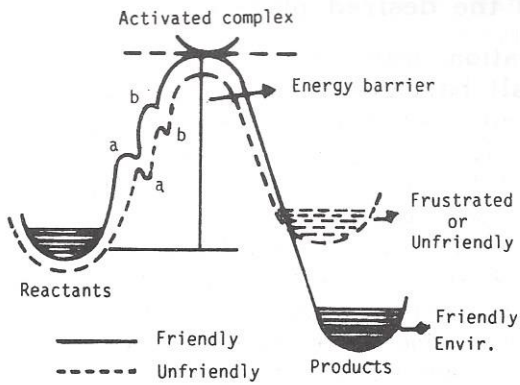

Fig. 9.2 Barrier to be surmounted to overcome frustration (a and b are meta-stable points which if not crossed would constitute a frustrating situation)

Interaction with the environment may be analysed by the reaction coordinates and energy diagrams as in Fig. 9.2. The conditions of interaction are different in the two sets, i.e. friendly and unfriendly. In an unfriendly environment, more energy has to be put in to cross the energy barrier and satisfy the need. The extra energy required to be put in depends on the degree of unfriendliness in the environment. There may be more than one energy barrier depending on the number of constraints. Blocking the reaction at an intermediate state, where it may be possible to reverse the equilibrium, creates frustration. For example, a person who has to travel by train to a remote place, not easily accessible otherwise, may have to pass through a series of events. He must book his seat in advance, have the necessary material ready before

departure,, have a vehicle available to take him to the railway station, reach the railway station in time, the railway wagon must have the booked seat available, the railway train must reach the connecting station in time, the next train should be available at the connecting station, this last train should reach in time and persons should be available at the desired place to guide him.

Frustration may occur at any of the above stages which are all barriers requiring an extra energy input to satisfy the ultimate need. The seat for the travel may not be available if one arrives at the station at the same time as the departure of the train. The material required to be taken to the destined point may not be ready and departure without it could be meaningless. A vehicle may not be available to take him to the railway station. One must be at the railway station well before time otherwise there might be little time to overcome an unforeseen event. The railway coach booked for the person may be out of order and one may even be faced with the situation to consider cancellation of journey, since travelling in a less previleged class could mean difficulties. The departure, travel and arrival of the trains are critical because any delay is likely to affect the schedule and one may be forced to stay on and wait for the next train which might be available perhaps the next day. Persons waiting at the point of destination would be frustrated if the train does not bring the desired person. Similarly, if there is no person at the station to attend to his arrival, lack of guidance may not allow the undertaking of the scheduled work plan.

The foregoing description bears out the earlier statement that behaviour is a complete process and not a material. The parameters determining the running of a process are themselves very many but those for behaviour are extremely complex. If it was any material its properties could be determined and its behaviour could be predicted. The characteristics of one man or even one twin differ from his counterpart and these depend on his interaction with the environment. The environment itself is very

complex and in the present context consists of (1) the physical environment around him, (2) the social environment to which he belongs and (3) the self i.e. the personality.

The physical environment needs proper management, in order to make living conducive e.g. food, clothing and shelter, which are the basic needs of a man, should be available. In Pakistan it is easy for certain classes of people to manipulate the three necessities but it is difficult for 25% of its people to have food to their desired need. The per capita consumption of food grains as well as cloth is very low and so is the ownership of a house. This shows that in the stratified society of Pakistan, only those nearabout the top enjoy the previlege of a conducive environment while the rest which is almost 80% keeps hoping for the best.

It has been stated earlier that if the needs of a person are not satisfied, he feels frustrated. The presence of 80% frustrated people should clearly create quite a problematic society. But this is not true of Pakistan alone. Population of developing countries of the world in general suffers from frustration. The behaviour of a person in a developing country ought to be different from that of another in a developed country where the basic necessities are usually provided.

Alleviation of frustration has usually been achieved through religious practices. All the well-developed religions preach physical restraint and modesty. In religious states, environmental conditions are so created as to weaken the forces which would elicit sinful behaviour. Occasions are created for virtuous behaviour and simple living is introduced and practised. The system works because of a group practice. The selfish and primarily reinforced behaviour is suppressed and the system works to the advantage of others. It is much better in mechanism compared with group control because of the moral obligations. All religions promote a behaviour which would benefit others. They all encourage love and charity to others. All temptations created

by the devil lead to sinful behaviour and the practice of self-control overpowers all such behaviour.

It is the developing countries where religion still dictates the living. However, the social environment in these countries is based on class structure and this again is a source of frustration. The structured society such as the one in Pakistan and other countries of Asia, has a number of strata. It has been observed that the top strata people are not so religious as are the poor or those in the lower strata. Many of the problems faced by these countries in respect of urbanization and mass emigration are a result of frustration created by the feeling of deprivation among the have-nots in the middle and lower strata of the society.

It would be worth examining if the average person in an environment like the above would be a normal person. By definition one who is well adjusted is a normal person and a well adjusted person is one who has succeeded in maintaining a course without deviation. A rolling stone type cannot accomplish adjustment as effectively as a persistent and consistent person loyal to a purpose. A person in a developing country has to have strong nerves to resist the present day temptation of easy living outside his country. Since he has an in-built feeling to get tempted, he does not follow a fixed course. If he gets deviated he is not loyal to his purpose. He can not, in all fairness, get adjusted in his own country. Such a person is not able to strike a balance between the demands of the society and his own wishes. Since normal behaviour comes out of adjustment, frustrated persons are less likely to be normal. They are unable to surmount the barrier in Fig. 9.2 which alone can remove frustration. This needs constant energy input which implies hard work and dedication but most certainly not the short-cut and cut-throat methods to satisfy a need.

SUGGESTIONS FOR FURTHER READING

This book may have done little more than create an interest of the sociologists to learn some Chemistry and Material Sciences and of the Chemists to know a few aspects of Social Sciences. Accordingly two sets of reading materials for the two types of readers are being provided here. There is also a list of articles which the author has taken as reference material in order to build up the hypothesis. If the readers respond and become interested in this approach to sociology they would naturally look for further information and the following references may be very useful. The classified lists are placed in an order corresponding with the chapter sequences.

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